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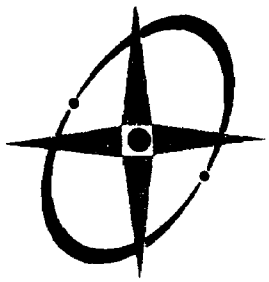
ABSTRACT

This proposal for the development of a system of administering hiking trails in the state of Hawaii when such trails would involve various public and private jurisdictions emphasizes three elements: (a) proposing means of administration involving multiple jurisdictions; (b) demonstrating by means of a proposed project on the west coast of the Big Island how such a trail administration would work and the benefits anticipated from it; and (c) showing how such a cooperative trails management system involving federal, state, county, and private agencies and individuals can lead to many benefits for all involved and for improved government-citizen management of Hawaii's basic natural resources. The basic concept underlying the proposal is that facilities which are functionally related should be administratively related as well. The concept involves the use of public rights-of-way across private land to connect existing and planned facilities such as parks into a coordinated administrative unit. The concept provides access and increased use without the burden of large fee purchases. The proposal itself consists of (a) an introduction that discusses the setting for the proposed demonstration project and the state and county policy framework; (b) an outline of the demonstration project; (c) a discussion of the administration of the trails system; (d) a survey of the demonstration project area including a general shoreline survey, coastal geology, coastal ponds, botanical resources, observed wildlife, places of historical, archaeological, and legendary interests; and (e) bibliographies. (Author/HMD)

NA ALA HELE (trails for walking)



Published by

DEPARTMENT OF LAND AND NATURAL RESOURCES
DEPARTMENT OF PLANNING AND ECONOMIC DEVELOPMENT

STATE OF HAWAII
March, 1973

JOHN A. BURNS
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF STATE PARKS
P. O. BOX 621
HONOLULU, HAWAII 96809

DIVISIONS:
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

March 1, 1973

Honorable John A. Burns
Governor of Hawaii
State of Hawaii
Honolulu, Hawaii

Dear Governor Burns:

It gives me considerable pleasure to transmit to you this proposal for a new concept in the cooperative management of recreational facilities and open space resources for the people of Hawaii.

This proposal is unique in several ways: It was developed jointly by the Department of Land and Natural Resources and the Department of Planning and Economic Development in cooperation with other State as well as County and Federal agencies. It also utilizes input from the private sector, and has the support of a wide range of agencies and individuals.

It is also unique in that the proposal includes a demonstration project on the Kamehameha Coast of the Big Island, allowing a coordinated movement from concept to implementation, all within the framework of the proposal.

Hawaii's open space resources, and particularly the shoreline, are generally agreed to be among the State's greatest assets. These areas provide not only recreation, but maintain for us all a link with the past which increases our appreciation of the unique qualities of our State.

The Na Ala Hele concept, as presented in this proposal, represents the combined efforts of several agencies and many individua Favorable reaction to this proposal will enable, and indeed encourage, the continuation of this kind of productive cooperation.

Very truly yours,

BOARD OF LAND AND NATURAL RESOURCES

Sunao Kido

SUNAO KIDO
Chairman & Member

STATE OF HAWAII

DEPARTMENT OF PLANNING AND ECONOMIC DEVELOPMENT

P. O. BOX 2359 • HONOLULU, HAWAII 96804

JOHN A. BURNS
Governor

SHELLEY M. MARK
Director

EDWARD J. GREANEY, JR.
Deputy Director

March 1, 1973

The Honorable John A. Burns
Governor, State of Hawaii
State Capitol
Honolulu, Hawaii 96813

Dear Governor Burns:

I am pleased to join with the Honorable Sunao Kido, Chairman and Member of the Board of Land and Natural Resources, in this transmittal to you of a copy of Na Ala Hele (Trails for Walking). This proposal represents further development of a planning concept for a Statewide Trail System. It is an outgrowth of the Ala Kahakai (Trail by the Sea) concept, first published in our Department's West Hawaii study.

This Na Ala Hele report is primarily the product of an extensive, multi-discipline, on-site survey of the Kamehameha, or West Coast of the Island of Hawaii. The basic concept has now been developed to benefit the entire State. Through the action recommended in this report, the Kamehameha Coast can become a major historical, cultural and recreational attraction, making possible more intensive use without abuse. Benefits can accrue to both the public and private sectors through such planned development.

This study-survey represents the collective efforts of many dedicated individuals in various government and private agencies. It includes the reports of scientists who took part in the field work in support of the project.

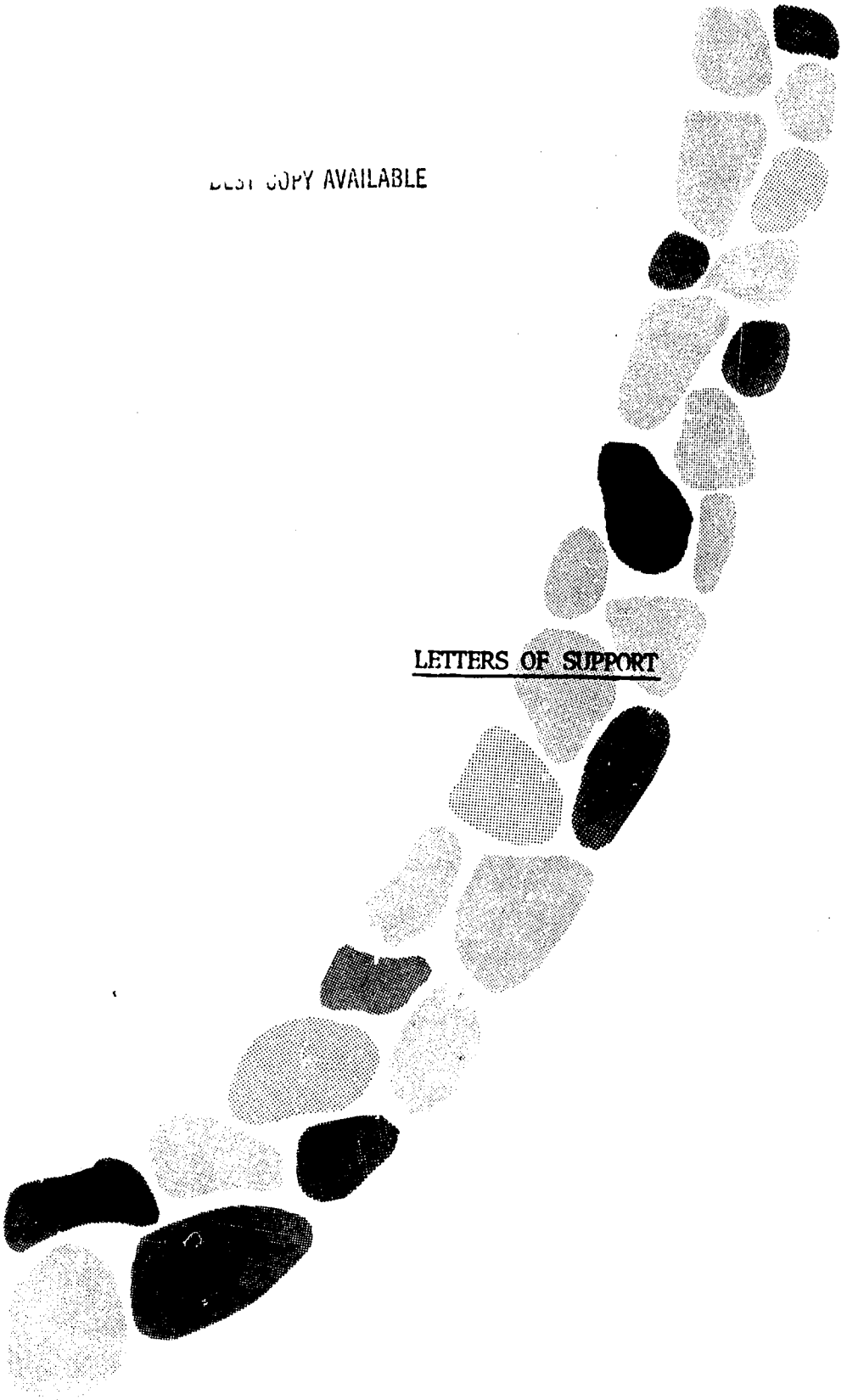
The preparation of this proposal is the beginning of a much larger effort that must be made to permit a plan to become a reality. To this end, I request your favorable consideration of the proposal.

Sincerely,

Shelley M. Mark

SHELLEY M. MARK

CONTENTS



LETTERS OF SUPPORT

United States Department of the Interior

NATIONAL PARK SERVICE

HAWAII GROUP
677 Ala Moana Blvd., Suite 512
Honolulu, Hawaii 96813

IN REPLY REFER TO:

January 16, 1973

Dr. Shelley M. Mark, Director
State Dept. of Planning and Economic Development
P. O. Box 2359
Honolulu, Hawaii 96804

Dear Dr. Mark:

I am most pleased to hear that a proposal for the Ala Kahakai may be submitted to the State Legislature soon. I believe that this concept is outstanding and offers a fresh and viable approach to the preservation of historic and natural features, and the opportunity for healthful outdoor recreation not only along the Kona Coast of Hawaii, but by extension to other areas as well.

As you know, the newly-authorized Puukohola Heiau National Historic Site, under the administration of the National Park Service, can form a bastion and entrance point to the trail system at its northeastern end. The National Park Service strongly believes in joint planning and cooperation in such broadly based recreational opportunities as this. If the concept is applied elsewhere, we will be most happy to participate where units of the National Park System are involved and to cooperate in any way that may be helpful to other areas.

The concept of joint state, county, federal, and private planning, management, and cooperation shows promise of fulfilling recreational and preservational needs far beyond any single sector's capabilities, and for this reason, it is a technique with great promise. It has the strong endorsement of the National Park Service.

Sincerely yours,

Robert L. Barrel
State Director

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
337 Uluniu Street
Kailua, Hawaii 96734
February 5, 1973

Dr. Shelley M. Mark, Director
Department of Planning and
Economic Development
State of Hawaii
1001 Richards Street
Honolulu, Hawaii 96813

Dear Dr. Mark :

Last fall I had the fortunate experience to participate for a short time in the field trip led by Virginia Brooks which involved hiking along the old Hawaiian trail and camping at various interesting places along the north Kona coast. I was impressed with the cooperation which existed among various members of the party, who represented a number of governmental agencies and academic disciplines, interested in the concept of a trail which would allow the public to visit and enjoy the natural scenic, scientific and historical features to be found along the coast.

Because of the diverse interests which would be represented, it follows that good planning for a system of public trails requires close coordination with the various interests involved. A proposed bill, No. N-5 (73) which would initiate, coordinate and develop plans for a demonstration park and trail system in West Hawaii, would be most helpful in initiating such planning effort.

Sincerely,

Eugene Kridler

Eugene Kridler
Wildlife Administrator

JOHN A. BURNS
GOVERNOR

FUJIO MATSUDA
DIRECTOR

E. ALVEY WRIGHT
DEPUTY DIRECTOR

LAWRENCE F. O. CHUN
DEPUTY DIRECTOR

MUNNY Y. M. LEE
DEPUTY DIRECTOR

DOUGLAS S. SAKAMOTO
DEPUTY DIRECTOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813

IN REPLY REFER TO:
HAR-B
1974

February 2, 1973

MEMORANDUM

TO: Honorable Shelley M. Mark
Director, DPED

FROM: Fujio Matsuda

SUBJECT: Ala Kahakai

The Department of Transportation supports the purpose and intent of the Ala Kahakai ("Trail by the Sea") concept.

E. Alvey Wright
for Fujio Matsuda

DEPARTMENT OF RECREATION
CITY AND COUNTY OF HONOLULU
1455 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96814

FRANK F. FASI
MAYOR
Paul Devens
MANAGING DIRECTOR

YOUNG SUK KO
DIRECTOR

RAMON DURAN
DEPUTY DIRECTOR

January 18, 1973

Dr. Shelley M. Mark, Director
Department of Planning and
Economic Development
State of Hawaii
P. O. Box 2359
Honolulu, Hawaii 96804

Dear Doctor Mark:

With the strong ocean orientation of both visitor and resident, the use of our limited and essentially unexpandable amount of shoreline for recreational purposes becomes mandatory.

On Oahu, there are approximately 10 linear feet of shoreline, or 2½ feet of sandy shoreline, for each beachgoer at the calculated peak period usage. There are 15 inches of sandy shoreline per beachgoer fronting publicly-owned property. Forty-eight per cent of the total shoreline, or 56% of the sandy shoreline and 46% of the rocky shoreline, is fronted by private property. Although this shoreline is public, the limitations in use imposed by inadequate or no access and absence of facilities make these areas of little value for general public use.

The utilization and capacity of the shoreline for recreational use are as dependent upon the "back-up" area as they are upon the frontage itself. It is in those areas that conveniences such as restrooms, parking and facilities to indicate appropriate activities must be provided. There, too, must be the open space to accommodate those not active on the frontage at any particular time. The Ala Kahakai concept, when put into operation, will provide the possibility for, and coordination of, the supply of those essential facilities.

We vigorously support the Ala Kahakai concept and urge that legislation be submitted for enactment to implement this

philosophy. The concept will be most significant in its effect on planning and development by maintaining favorable economic and environmental circumstances while providing for the essential shoreline recreational facilities.

Sincerely,

Ramon Duran

for YOUNG SUK KO, DIRECTOR

COUNTY COUNCIL
County of Hawaii
Hawaii County Building
Hilo, Hawaii 96720

In Reply Refer
To: Ala Kahakai
Shoreline Trail
West Hawaii

Dr. Shelley M. Mark
State Of Hawaii
Department Of Planning And Economic Development
Honolulu, Hawaii

Dear Dr. Mark:

The recreation committee of the Hawaii county council wholeheartedly endorses the "Ala Kahakai" shoreline access concept and will exert every effort in coordination with the full county council and the county administration to bring to reality this important project.

Please be assured that we will be prepared to take positive action to coordinate with the State to achieve the objectives of this significant plan for the better utilization of our great natural recreational amenities.

Very truly yours,

William S. Kawahara

William S. Kawahara, chairman
Recreational Committee
Hawaii County Council

cc: Mayor Shunichi Kimura
Chairman Robert M. Yamada

OFFICE OF THE MAYOR — county of hawaii, hilo, hawaii 96720

January 31, 1973

SHUNICHI KIMURA
MAYOR

Dr. Shelley M. Mark
Department of Planning and Economic
Development
P.O. Box 2359
Honolulu, Hi 96804

We appreciate the efforts of the Department of Planning and Economic Development in actively pursuing the Ala Kahakai (Trail by the Sea) concept, especially where it concerns the areas under imminent threat of development along the new Queen Kaahumanu Highway.

It is our expectation that the County of Hawaii will go on record supporting the concept by means of a County Council Resolution scheduled for consideration at their meeting on February 7, 1973.

I hope that this will have a positive effect on the pending legislation.

With personal best wishes.

MAYOR

SK:pak

WILLIAM S KAWAHARA
COUNCILMAN

COUNTY COUNCIL

COUNTY OF HAWAII
HAWAII COUNTY BUILDING
HILO, HAWAII 96720

February 14, 1973

Dr. Shelley Mark, Director
Kamamalu Building
1010 Richards Street
Honolulu, Hawaii

I hereby transmit a copy of Resolution No. 23 which was adopted by the Council of the County of Hawaii on February 7, 1973.

William S. Kawahara
COUNCILMAN

Attach.

County of Hawaii--State of Hawaii

Resolution

WHEREAS, there is a need to develop and coordinate plans for a demonstration park and trail system on the Island of Hawaii to be known as Ala Kahakai project; and

WHEREAS, the Ala Kahakai project will supply a wide range of recreational needs for almost every user group, provide a showcase for the unique, natural and cultural treasures of this area for both visitors and residents, and will help to develop the economic potential of the region by a method compatible with maintenance of natural and cultural resource values;

NOW, THEREFORE, BE IT RESOLVED by the Council of the County of Hawaii, on behalf of the people of the Big Island, that it go on record as fully supporting strong, effective legislation to implement the Ala Kahakai or "trail by the sea" concept.

BE IT FURTHER RESOLVED that the County Clerk of the County of Hawaii is hereby authorized and directed to transmit true copies of this resolution to the Honorable John A. Burns, Governor, State of Hawaii; the Honorable David C. McClung, President of the Senate; the Honorable Tadao Beppu, Speaker of the House of Representatives, State of Hawaii; and all of the Legislators from the County of Hawaii.

Dated at Hilo, Hawaii, this 7th day of February, 1973.

INTRODUCED BY:

Councilman, County of Hawaii

COUNTY COUNCIL
County of Hawaii
Hilo, Hawaii

I hereby certify that the foregoing RESOLUTION was by the vote indicated to the right hereof adopted by the COUNCIL of the County of Hawaii on

February 7, 1973

ATTEST:

Tadashi Suzuki
COUNTY CLERK

Robert M. Yamada
CHAIRMAN & PRESIDING OFFICER

14

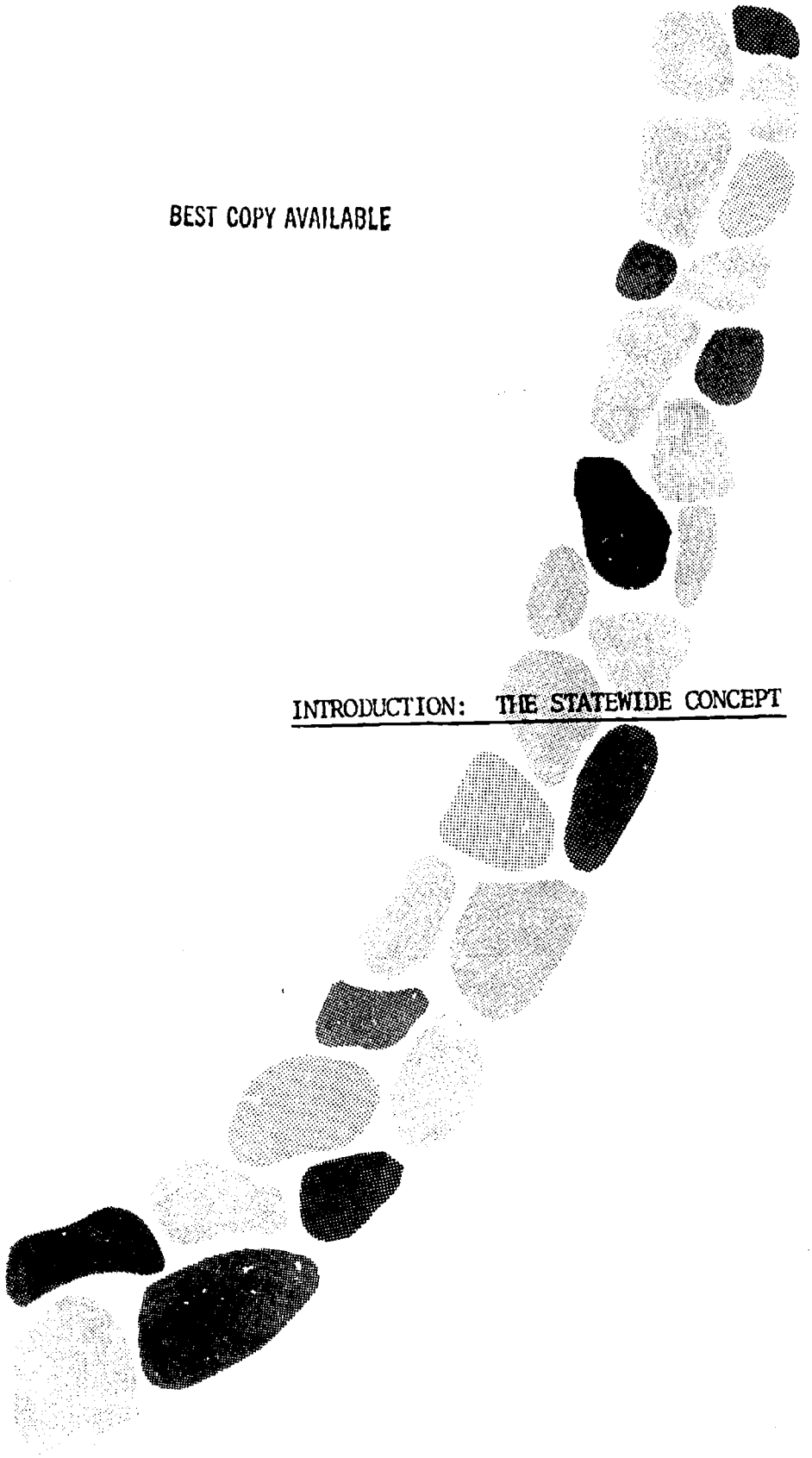
ROLL CALL VOTE

	AYES	NOES	A
Carpenter	X		
De Luz	X		
Farias	X		
Fujii	X		
Hisaoka	X		
Kawahara	X		
Matayoshi	X		
Yadao	X		
Chr. Yamada	X		
	9	0	

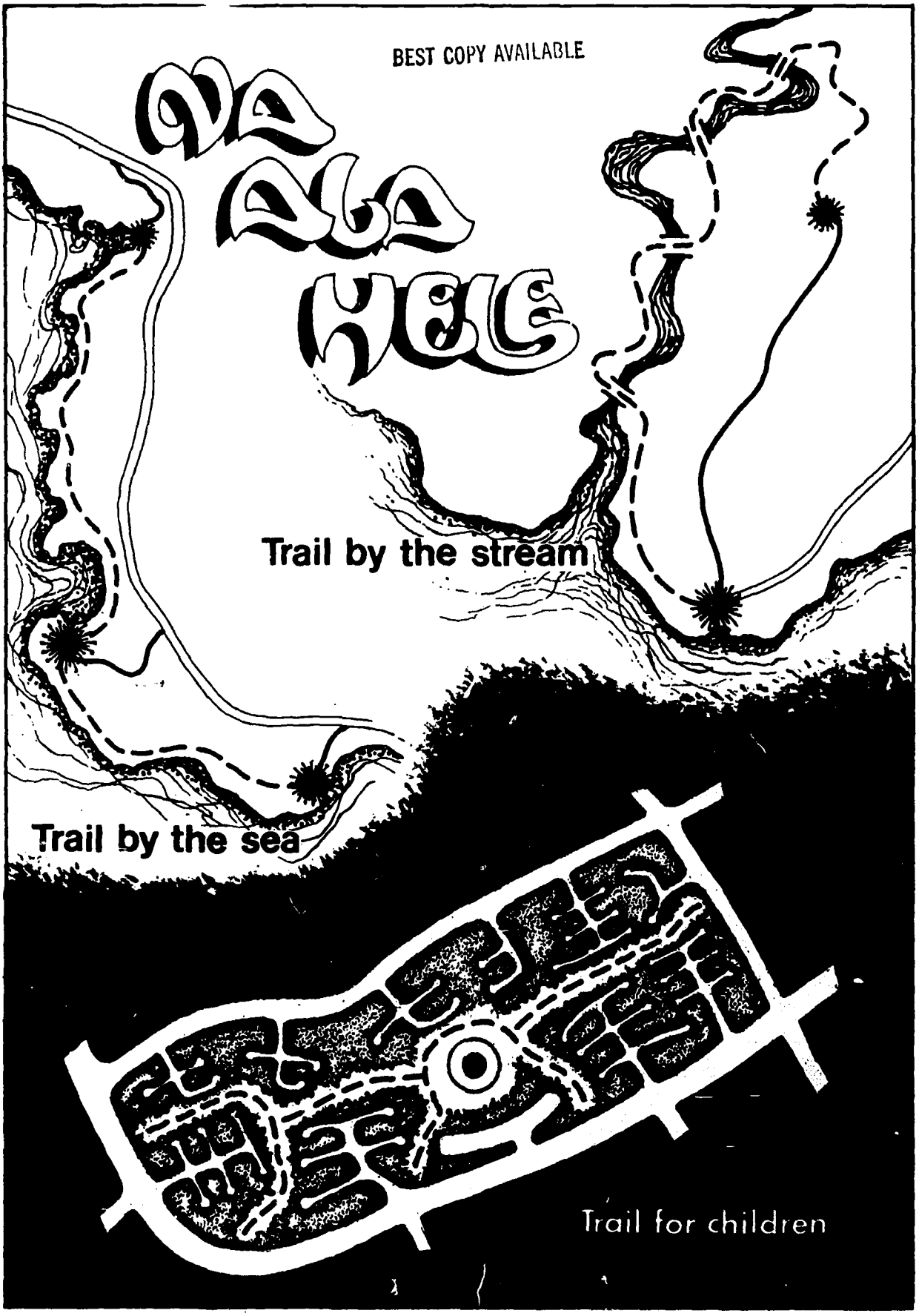
Reference: C-83/RC-3

M.B. No. .....

23



INTRODUCTION: THE STATEWIDE CONCEPT



INTRODUCTION: THE STATEWIDE CONCEPT

The Hawaiian words, Na Ala Hele, mean "hiking trails," or literally, "trails for walking."

This publication is a proposal for developing a system of administering hiking trails in the State of Hawaii when such trails would involve various public and private jurisdictions. Its basic goal is to lead to the establishment and maintenance of permanent trail systems for Hawaii's people so they may enjoy the outdoors without the hindrances of lack of access, excessive governmental or private restrictions, and similar complications.

The emphasis in this report is on three elements:

1. Proposing means of administration involving multiple jurisdictions.

2. Demonstrating by means of a proposed project on the Kamehameha Coast of the Big Island how such a trail administration would work, and the benefits anticipated from it.

3. Showing how such a cooperative trails management system involving Federal, State, County and private agencies and individuals can lead to many benefits for all involved, for the environment, and for improved Government-citizen management of Hawaii's basic natural resources.

The basic concept underlying this proposal is that facilities which are functionally related should be administratively related as well. More particularly, the concept involves the use of public rights-of-way across private land to connect existing and planned facilities, such as parks, into a coordinated administrative unit. The concept provides maximum access and increased use without the burden of large fee purchases. While it is equally applicable to shoreline, mountain, and stream situations, the West Hawaii coastline is suggested as the location for the first demonstration of this technique. After policies for administering such a linear system, coordinating the activities of several agencies, and providing incentives for such negotiated rights-of-way are developed through this demonstration project, the planning technique can be applied to diverse situations through the regular channels of line agencies.

Precedents for this kind of coordinated administration already exist, both in the State of Hawaii and on the Mainland. The Bureau of Outdoor Recreation Land and Water Conservation Fund is a regular source of grants to the State for park planning and acquisition. The State, in turn, works with the State and County parks agencies

in utilizing these grants for particular projects. Thirty-eight recreation projects have been completed under this program. Federal-State-County cooperation is also achieved through the U.S. Department of Housing and Urban Development's "701" planning grant system.

On the Mainland, the idea of multiple administration of trail systems is a relatively new one, but has been shown to be a workable concept. The Appalachian Trail is one example, under the administration of the 14 different States through which it passes, as well as the National Park Service and the National Forest Service. The public also has considerable input through a federation of hiking and trail clubs.

The Pacific Crest Trail and the Oregon Coast Trail are two other Mainland projects relevant to the Na Ala Hele concept. While all three of these trail systems are discussed in detail in another part of this book, it is important to remember that the Na Ala Hele concept is particularly oriented to Hawaii. Not only does this State have a streamlined government structure; the "aloha spirit" of excellent cooperation of public and private sectors is present as well. In addition, any trail system developed in Hawaii will involve only one State; the problems of several "sovereign states" administering the same trail system cannot exist in Hawaii. For these reasons, the proposed multiple administration of trail systems in Hawaii can be anticipated to have a favorable outcome.

The Setting: Hawaii's Kamehameha Coast, 1973

The West Coast, or Kamehameha Coast, of the Big Island is one of the fastest growing areas of the State in terms of resort development, and was the regional focus of the State's recently-published Hawaii Tourism Impact Plan. Volume II is titled West Hawaii, and contains the initial formulation of the proposed trail concept.

The Kamehameha Coast is high in natural and cultural values. The new Queen Kaahumanu Highway, from Kawaihae to Kailua, will accelerate development in the area and place an increased stress on natural and cultural resources. Much greater use of recreational facilities is expected as the shoreline corridor is made more accessible. State, County and Federal facilities are proposed or already in existence in this area. Through the application of this concept in a demonstration project, the benefits derived from these facilities will be greatly increased.

This demonstration project, as applied to the Kamehameha coastline of the Big Island will:

1. Supply a wide range of recreational and vocational needs for almost every user group: fishermen, snorkelers, hikers, campers, swimmers, photographers, historians and anthropologists.

2. Provide a living laboratory for the environmental education of Hawaii's youth.

3. Provide a showcase for the unique natural and cultural treasures of this area, open to visitors and residents alike.

4. Help to develop the economic potential of West Hawaii by a method compatible with maintenance of natural and cultural resources.

5. Demonstrate the ability of all levels of government in Hawaii to work together constructively along with the private sector toward fulfillment of a shared goal.

The State and County Policy Framework

Comprehensive and coordinated planning of any project which involves a number of governmental and private jurisdictions can be complicated by a variety of policies and programs of each agency involved. What one may permit another may forbid. The purpose of planning coordination is to iron out these wrinkles in the fabric of any worthy project desired by all parties.

It is notable that in the case of this demonstration project, the concept appears to have a most favorable policy climate due to the very nature of the project itself, and its consonance with the stated goals and objectives of Federal, State, and County agencies related to such types of activity.

Following are portions of various governmental documents which emphasize the value of, and need for, such types of projects.

"In light of competing demands and the urgent need to protect and to give high priority to natural systems in the coastal zone, present state and local institutional arrangements for planning and regulating land and water uses in such areas are inadequate..." Sec. 302, Part g, Coastal Zone Management Act of 1972 (92nd Congress).

"... a 'system' of open space from Haleiwa to Kahana Bay, predominantly following a trail system ... Thus is possible the full experience of open space from the mountain to the sea, and such items as service nodules for campers, facilities for shorter versions of the experience, etc., could be coordinated with the various agencies involved with the various lands along the route." Pp. 100-101, State of Hawaii Comprehensive Open Space Plan, 1972.

"Connections will also be emphasized between shoreline and inland areas, so hikers can walk from shoreline parks along stream valleys to reach mountain ridges. Trails will also connect shoreline recreation areas. This would allow campers and hikers to explore

segments of the coastline, utilizing overnight campgrounds and shelters located within beach parks. In more developed shoreline park areas, trail and walkway systems can serve or act as connections between beach park areas thus allowing several parks to function as a recreation unit and increasing the variety of activities available." P. 171, State Comprehensive Outdoor Recreation Plan, 1971.

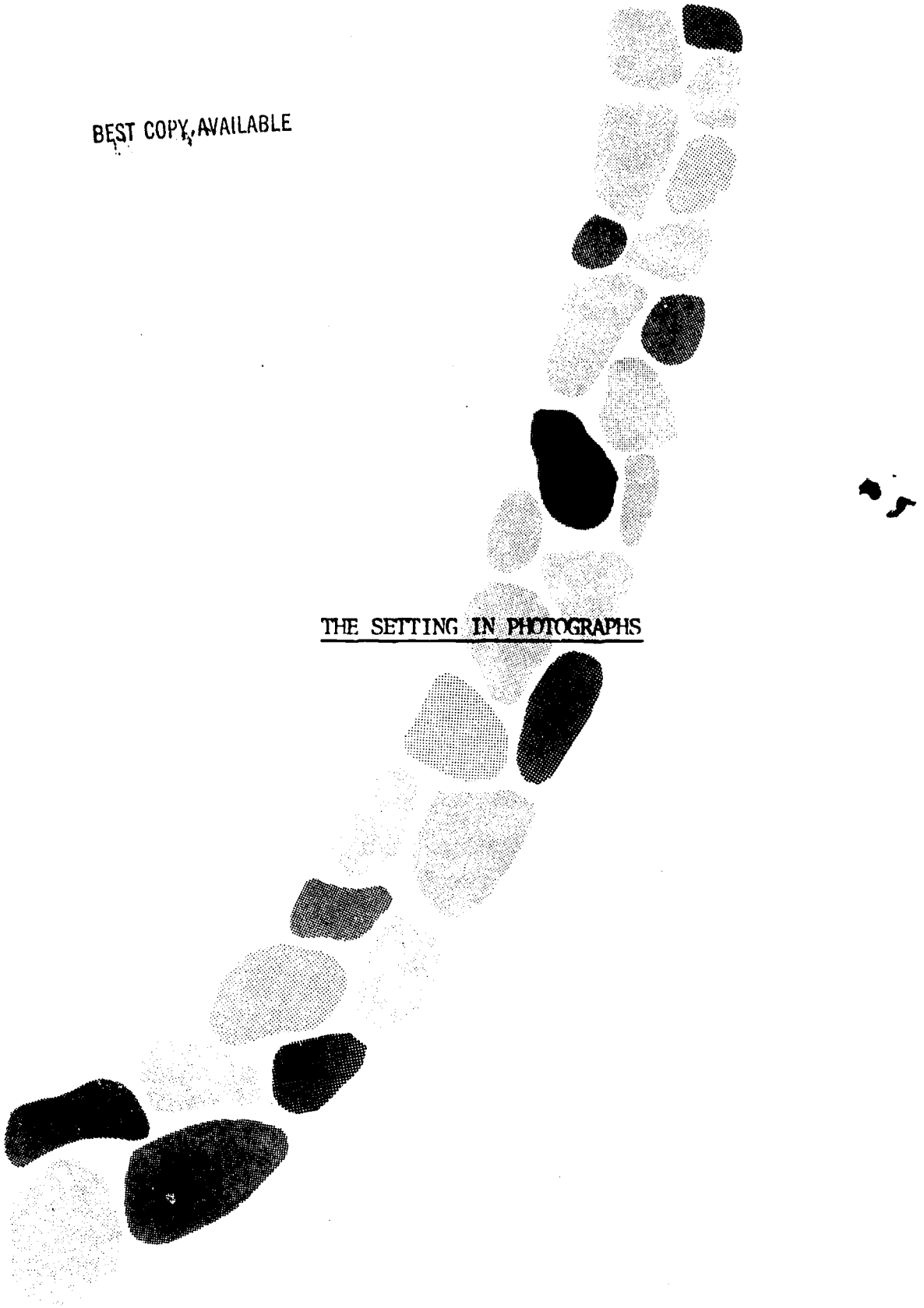
"A system of trails to places of scenic, historic, natural, or recreational interest should be established." P. 63, The General Plan, County of Hawaii, 1971.

"The shoreline of the island of Hawaii should be maintained for recreational, educational, and/or scientific uses in a manner that is protective of resources and is of maximum benefit to the general public." P. 44, The General Plan, County of Hawaii, 1971.

"Conservation of the hills, mountains and our oceanfront must have a high priority in citizen and government action and behavior." P. 12, "Issues, Goals and Objectives for the Seventies and Beyond," City and County of Honolulu, 1971.

"The opportunities for providing contiguous, visual and actual open space are purely a function of development control. Where open space exists in a contiguous form, care should be taken in preserving that resource as it relates to overall future developed area. Connections should be provided through construction of pedestrian ways, bike-ways, etc., as these connections are feasible to allow for both choice of access to recreation areas, and for recreation itself." P. 20, Wailuku-Kahului General Plan, County of Maui, 1972.

"To provide for a maximum variety of outdoor recreational activities... To recognize those aspects of the Island and its people which are historically significant, and to preserve and promote them as a continuing expression of the Island's physical and social structure... To promote the improvement and expansion of the Island's economy, by recognizing and carefully utilizing land and water resources... To guide and control development to take full advantage of the Island's form, beauty and climate and preserve the opportunity for an improved quality of life." P. 25, Kauai General Plan, County of Kauai, 1970.



THE SETTING IN PHOTOGRAPHS

THE SETTING IN PHOTOGRAPHS

The Kamehameha Coast of the Big Island of Hawaii is one of the most beautiful in the State, and one essentially unspoiled. Providing public access for "use without abuse" through a multi-jurisdictional trail system is proposed in this report.

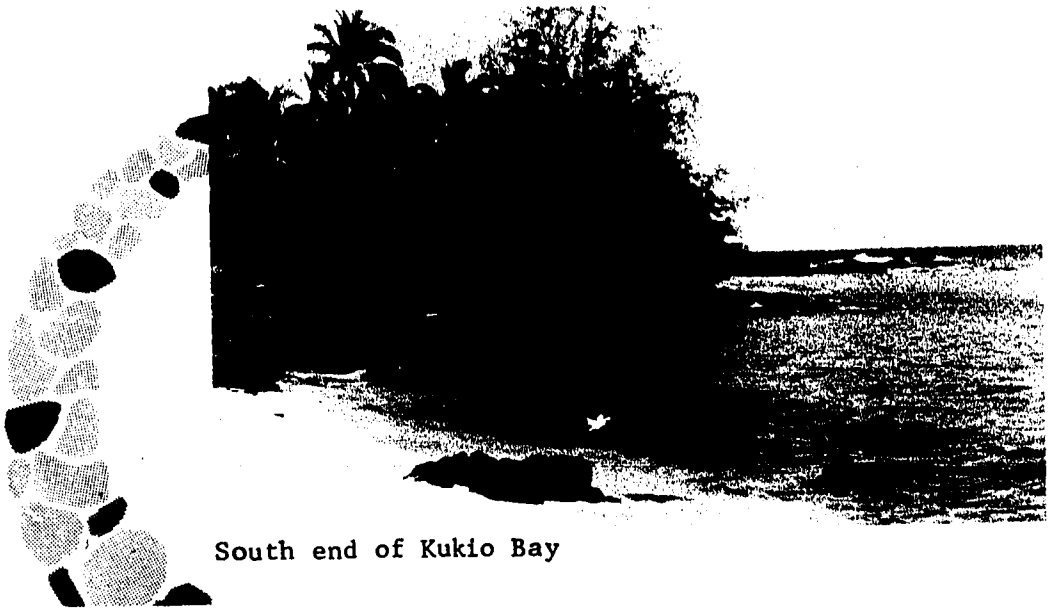
The following pages contain photographs showing various points along the proposed Ala Kahakai, or Trail by the Sea. The proposal itself is outlined in more detail in the sections which follow.

View looking southeast from the north end of the Kiholo Bay Lagoon

Black sand beach north of Makolea Point

Sand beach on the southeast shore of Mahaiula Bay

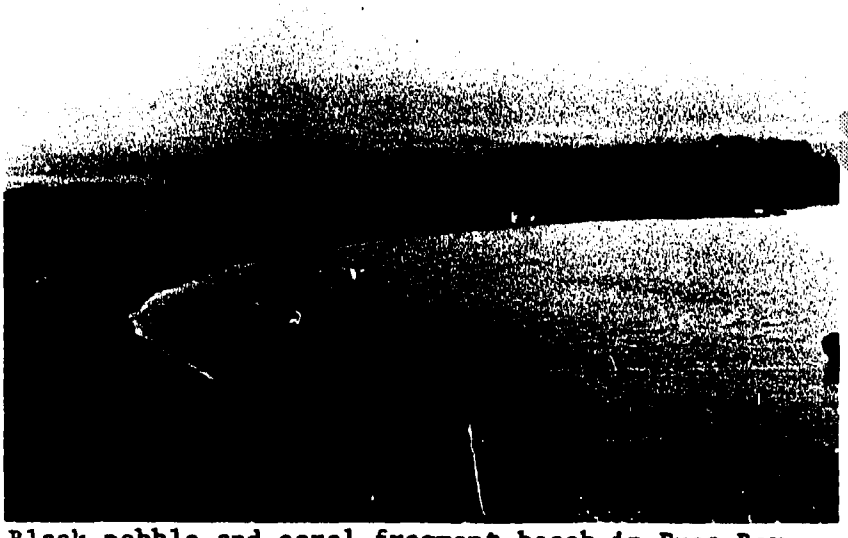
Kua Bay is the site of a proposed county park



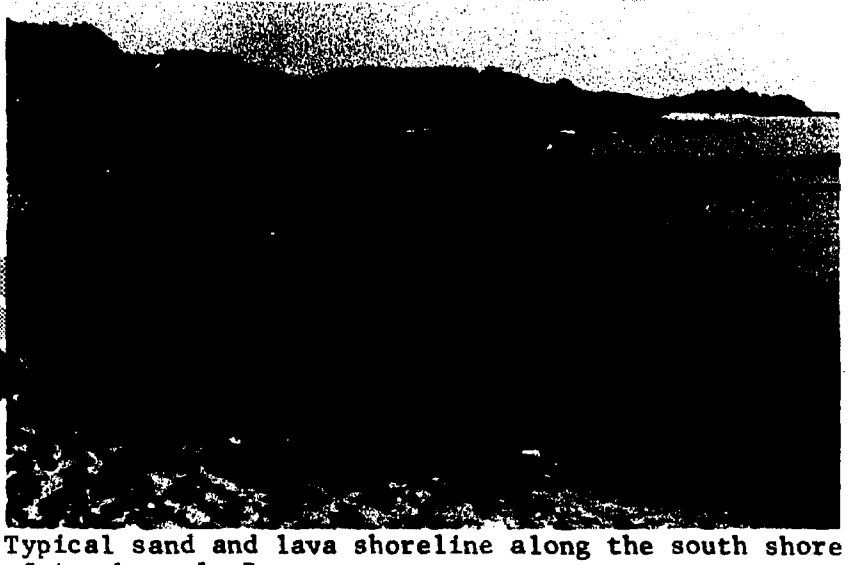
South end of Kukio Bay

Shoreline east of Lae Mano

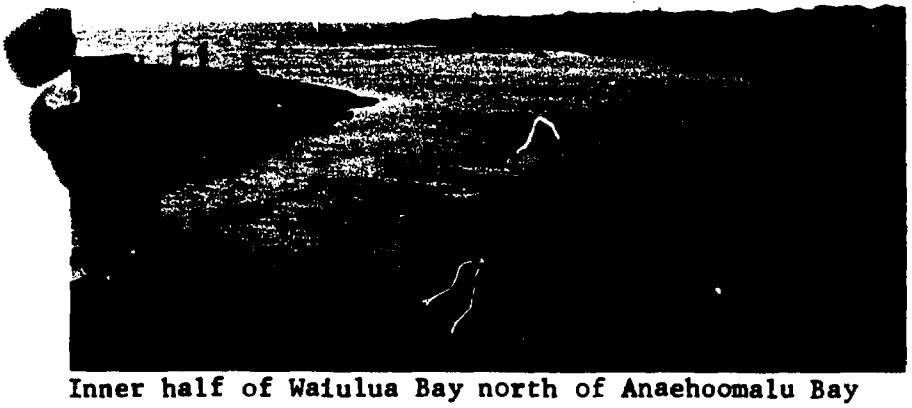
View looking southeast from the north end of the Kiholo Bay lagoon



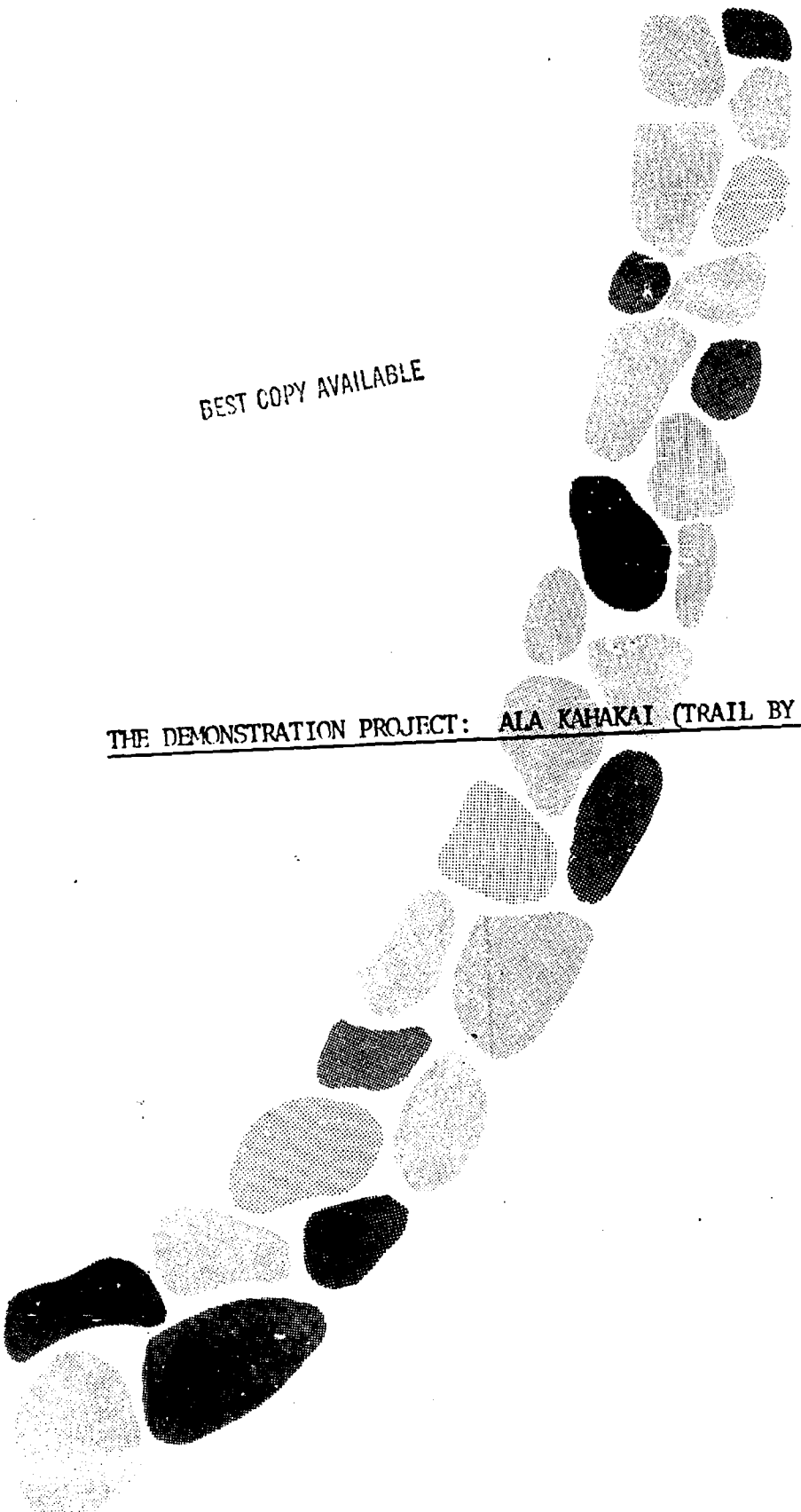
Black pebble and coral fragment beach in Pueo Bay



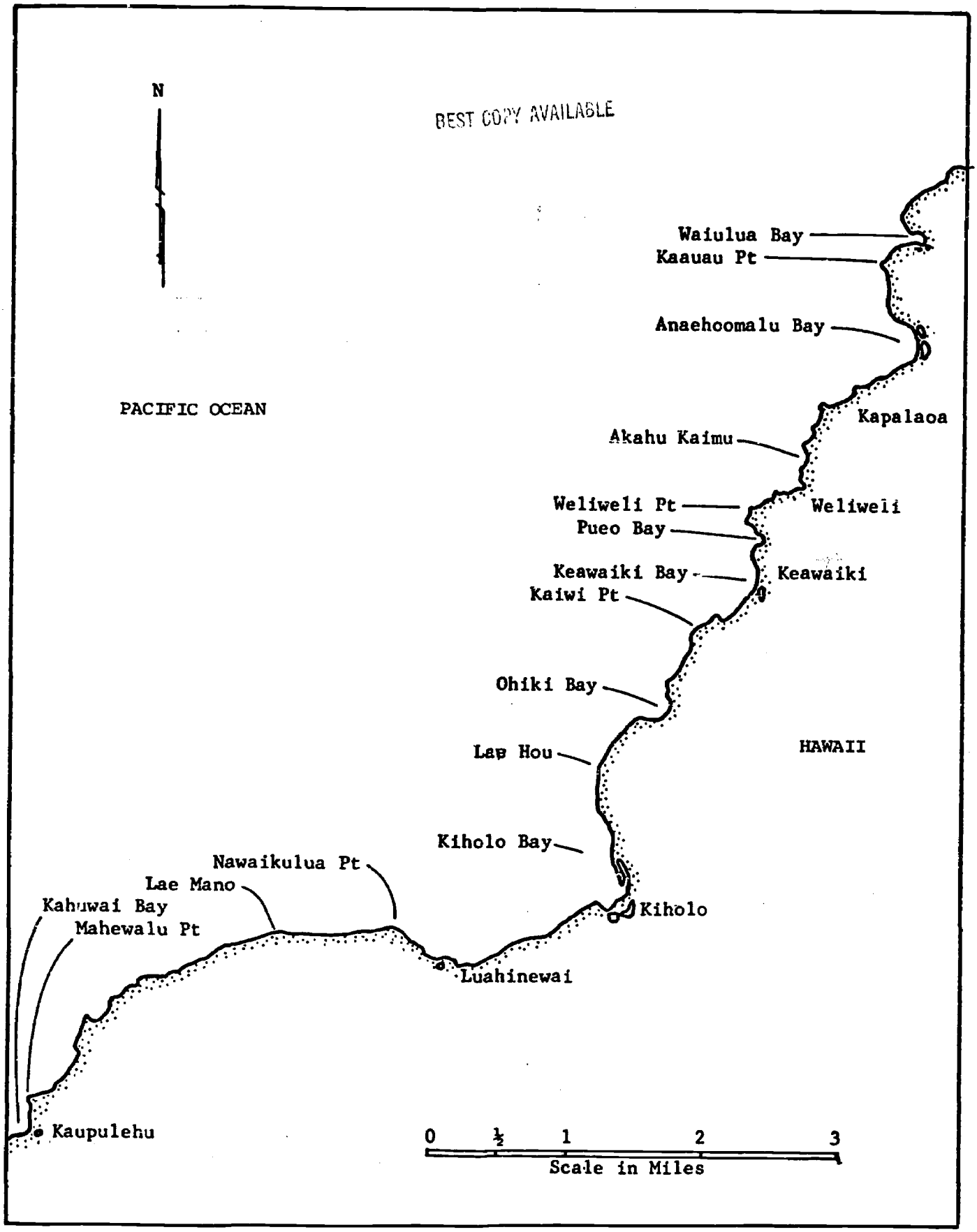
Typical sand and lava shoreline along the south shore of Anaehoomalu Bay



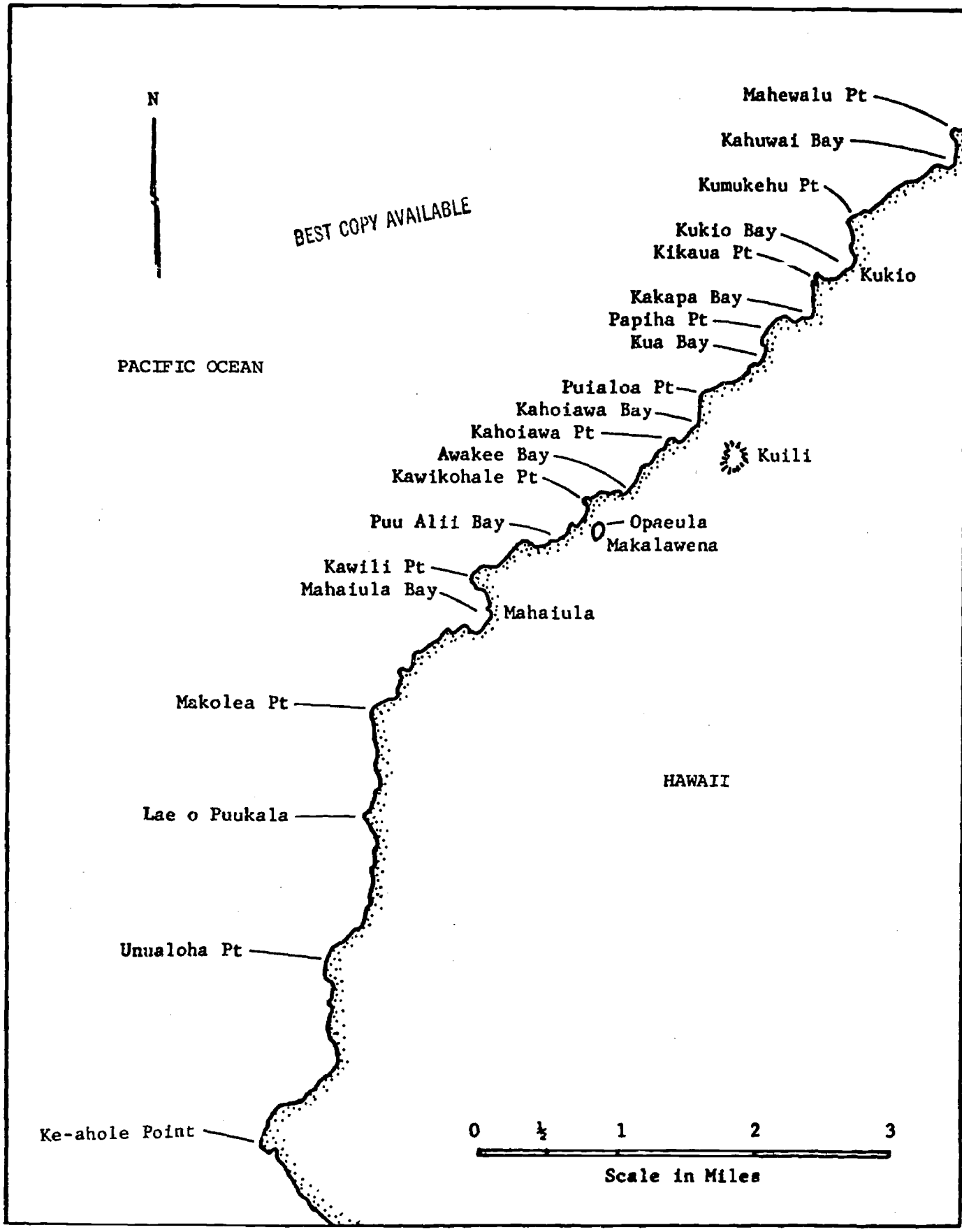
Inner half of Waiulua Bay north of Anaehoomalu Bay



THE DEMONSTRATION PROJECT: ALA KAHAKAI (TRAIL BY THE SEA)



Map of the shoreline between Waiulua Bay (South Kohala District) and Kahuwai Bay (North Kona District), Island of Hawaii.



Map of the shoreline between Mahewalu Point and Ke-ahole Point in the North Kona District, Island of Hawaii.

THE DEMONSTRATION PROJECT: ALA KAHAKAI (TRAIL BY THE SEA)

The Ala Kahakai project will provide about 50 miles of trails, give access to about 35 miles of shoreline, and unite three County Parks, a Bird Refuge, a National Historic Park, two small Boat Harbors, two State Parks and a State Historic and Recreation Area into an integrated system. These major facilities would be the service nodules for the system, providing parking, restrooms, camping areas, etc. Automobile access would interface with the trail system through these parks. The only other access to the Ala Kahakai trails would be by means of loop trails from parking provided at wayside view areas adjacent to the highway. Thus, while several shoreline areas would be accessible by car, other parts of the system would have a minimum of development and retain existing wilderness characteristics.

Starting at the County Park being developed at the old Kona Airport site, heavy use is expected because of the proximity to the fast growing urban area of Kailua. Attention should be given to a pedestrian and bicycle access path from Kailua.

North of the old Kona Airport site and south of Kaiwi Point, there are many house sites and agricultural areas. William Ellis, (1823) described this area as a pleasant place with shade trees and "The environs were cultivated to a considerable extent...". Some of the area might be restored to demonstrate early Hawaiian agricultural techniques for a dry area.

The shoreline from here to Honokohau is pahoehoe and the sea can be heard in the lava tubes under a hiker's feet, even to a considerable distance inland. Behind the lava shore are small storm beaches and there are a few native plants, such as the silver-grey-green hinahina and the large-leafed noni. The noni was one of the most important plants in the natural "drugstore" used by the Hawaiians. The near-shore water is quite clear and brightly colored fish are visible from the high shore. Just south of the Honokohau Boat Harbor is a small sandy beach with quiet, shallow water, ideal for family use.

The Honokohau area was inhabited from pre-historic times until about 1920 and there are many visible remains of this long settlement. Just north of the boat harbor, Aimakapa Pond is vaulable as a bird refuge. The activity at the boat harbor, combined with the interpretation of the past culture which flourished here, will make an exciting recreation area.

There are four large private holdings between Honokohau and the

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This section was prepared by Virginia Brooks, State Department of Planning and Economic Development.

State-owned land surrounding the airport at Ke-ahole Point. A pedestrian right-of-way would have to be negotiated. A refreshing pond lies in a rough lava flow near the Honokohau-Koloko boundary. Surrounded by several large, cut stone ahu (cairns), it is called the Queen's Bath. It is said that the Queen was transported by canoe to a nearby landing and then carried over the rough lava to the ahu-guarded pool where ledges of smooth stone had been placed for her comfort. Now, commoners hiking the trail and exploring this fascinating area will welcome the fresh, cold, spring-fed pool.

North of this at Koloko there is a grove of palms and a large fishpond where the owner plans to develop a resort. The pond, separated from the ocean by an ancient 700-foot stonewall, is under study by the Federal Government for possible preservation. The Ala Kahakai trail might use the pond wall which is described in the State of Hawaii Land Court Title as a public pedestrian right-of-way.

A jeep road follows the shore around Ke-ahole Point and then cuts across the lava to Mahaiula Bay. There are many ancient sites and some brackish ponds at Mahaiula, as well as a curving white sand beach. Except for a kuleana behind the beach, the land is owned by the State. There are vestiges of an old trail at the edge of the beach through the kuleana and as the trail crosses the lava flow between the kuleana and Makalawena, some of the smooth grey stepping stones are still in place.

Makalawena is characterized by white sand dunes tied down by ropes of the native Hawaiian pohuehue, a turquoise sea and the beeps of the rare, native stilts at Opaeula Pond. There was an important fishing village here before the 1946 tsunami. A bird refuge is planned for the pond and this will be an access point for the trail, but not a major service nodule. The ahupuaa of Makalawena is owned by the Bishop Estate.

North of Makalawena is Awakee where the cinder cone, Kuili, is a landmark for miles around. There are cool brackish ponds to comfort a tired hiker's feet and many interesting sites for the student of archaeology. A trail would need to be constructed along the shore.

The next bay is Kua, in the ahupuaa of Maniniawali. It is a pleasingly shaped bay with a white crescent beach which forms a dramatic contrast with the black lava surrounding the bay. An archaeological survey should be done before construction of the planned County Park. This will be a major trail entry and service nodule, including a road from the new highway, parking, restrooms, picnicking and camping areas.

The trail from Kua Bay to Kukio crosses a rough lava flow and needs considerable reconstruction. Kukio is privately owned as is the next ahupuaa of Kaulupulehu. There are many historic and prehistoric sites in the area and legends offer interesting interpretive material. This place name means "the roasted breadfruit," and one of the legends about the area explains how the name came

about. The petroglyphs of this place are unique. The Kona Village Hotel in this ahupuaa encourages its guests to visit these and other Hawaiian sites.

The part of the Ala Kahakai system between the Kona Village Hotel and Kiholo is one of the most difficult. At the present time most of the distance is either sand or rough aa lava and there are no ponds of cool water until the hiker reaches the southern end of Kiholo Bay. It is, however, an interesting shoreline. The ancient trail crosses two rough aa flows and in between there is a low pahoehoe shoreline with many interesting tidewater pools. Some of the opihis to be found here are 3 inches across.

Marked by white coral pohakupuna (stones), the trail climbs across a jagged flow and comes down to a smoothly curving grey sand beach. The water is clear and there is a striking display of corals and reef fish. Behind the beach is the deep, cold pond of Luahine-wai ("old woman" pool). This pond, the deepest along the coast, is said to have a resident mo'o (guardian spirit).

The lava flow of 1859 destroyed most of Kamehameha's large fishpond at Kiholo and created a new headland north of the bay. There are still several inland ponds, but they need major cleaning and restoration of the makaha (water circulation channels between the pond and the sea) which were destroyed by tidal waves.

There are both historic and prehistoric sites in this interesting area, including the shell of a tiny "hotel", where the proprietor is said to have charged 50¢ a glass for drinking water which he got from the fresh water springs revealed just offshore at low tide.

Kiholo Bay will be a State Park and a major trail service area. The development will be low key, with a number of small picnic sites separated for privacy, and connected by trails. There will be a strong emphasis on interpretation of the interesting features of the area and necessary construction will be blended into the site rather than imposed on it. The highway will be only 2/3 of a mile from Kiholo Bay and archaeological work should be done before the area becomes more easily accessible to the general public.

The 1859 lava flow north of Kiholo covered whatever trails existed before that time, but since this portion of the flow is smooth pahoehoe, walking along the low cliffs is fairly easy. Many fish, such as the reddish brown or brilliant blue uhu, large ulua, and leopard rays, as well as crabs, opihi, and ha'uke'uke can be seen from the shore.

For those who want a more direct, inland trail, the Kiholo-Puako horse trail needs only minor repairs and clearing. The old branch routes from this historic horse trail to the prehistoric shoreline foot trails should be re-identified. There are many brackish ponds between Keawaiki and Anaehoomalu and the oasis shade

of the trees associated with them is a welcome sight.

In association with some of the ponds between Kukio and Kapalaoa, there are several individual plants of a rare loulu palm believed to be unique to the region. All of its relative loulus are mountain dwellers. At the private beach just south of Anaehoomalu, there are beautiful plantings of the Hawaiian endemic, maiapilo. Other natives such as kou, milo, kamani and hala, could be planted as they were when large populations of Hawaiians managed to live fairly comfortably along this seemingly barren coastline.

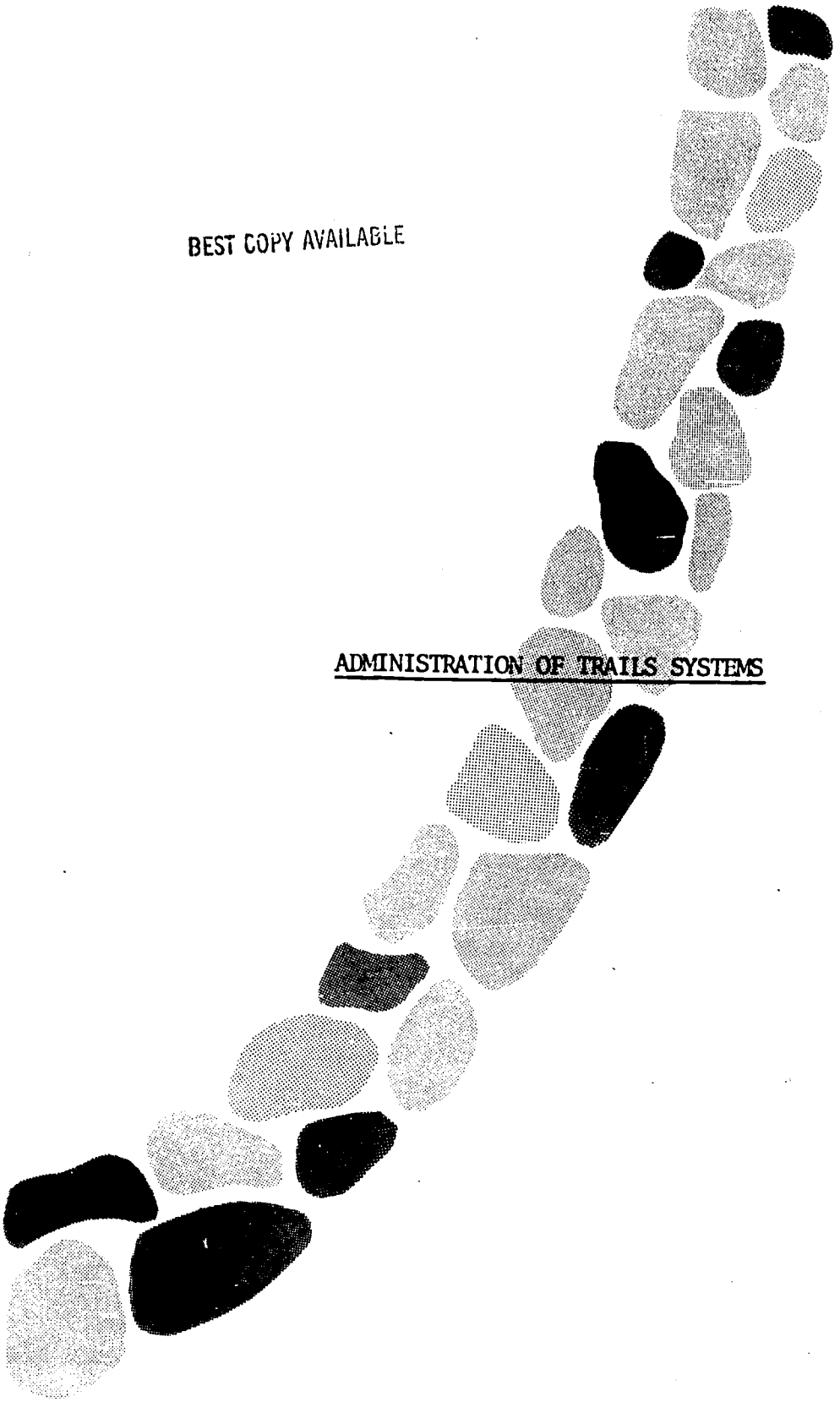
In recent times the fishponds of Kuualii and Kahapapa at Anaehoomalu have been one of the sources of mullet pua (juvenile mullet) as stock for the Kaloko fishpond. Studies of pond and ocean mullet would provide much needed information on them, the coastal zone in which they thrive, and how they can be utilized as a resource.

North of the long curve of palm-shaded beach that separates the ocean from the fishponds at Anaehoomalu, there is Waiulua Bay with its brackish ponds. Many of the ponds are decoratively bright with orange and yellow algae and some of them contain rare mutated species that delight a marine biologist.

From Anaehoomalu north to Puukohola the trail would at times follow the shoreline, and at other places detour around development already in place. The next major access and park would be Hapuna Beach where a major State Park is being developed. The northern terminus would have a variety of interesting focal points: the sandy beach at Spencer Park, the activity at the small boat harbor planned at Kawaihae, and the impressive Puukohola heiau, being reconstructed by the National Park Service.

At each of the park entry points there would be interpretive literature and self-guiding trails to assist people in understanding the features of that area.

The trail would be patrolled by rangers, knowledgeable and interested in the area, who would control and assist by creating a host and guest relationship with trail users. The peaceful spirit of aloha would be the guiding principle of Ala Kahakai, where the present would walk hand in hand with the past.



ADMINISTRATION OF TRAILS SYSTEMS

ADMINISTRATION OF TRAILS SYSTEMS

Implementation of the Ala Kahakai concept will require State legislative action as well as action by other jurisdictions. It is essential, therefore, that a general review of the administration of trail systems in the United States and elsewhere be presented here for the guidance of officials who may be called upon to make decisions on organization and funding. More specifically, an administrative structure for Ala Kahakai must be proposed for review and action. Jurisdictional conflicts and complex patterns of land ownership and control in the Kamehameha Coast region underscore the need for a viable means of organizing and managing such a system. The objective of this section of the report is to examine the alternatives and suggest an administrative structure or structures that might best achieve the purposes of Ala Kahakai, with the hope that the concept may be expanded into a Statewide system of trails and trails administration.

Puukohola, a national historic park near Kawaihae, has been proposed as an appropriate starting point for Ala Kahakai. It was here that Kamehameha the Great killed his opponent and gained control of the Big Island as a first step toward unifying Hawaii. Between this site and the old Kona Airport (a County park), 50 miles of trails along about 35 miles of shoreline would be linked by two more County parks, two State parks, two State small boat harbors, a State Historic and Recreation Area, and a National Bird Refuge. These facilities would serve as access points from the main coastal highway and as service nodules, providing parking, restrooms, picnic and camping areas, concessions, etc. Certain resorts on private land which have access to the highway may also function as "service nodules."

Completion of the Queen Kaahumanu Highway from Ke-ahole to Kawaihae will improve access to a scenic and relatively undeveloped shoreline containing features of historical, cultural, biological and geological significance. This coastal zone also holds great recreational potential. In anticipation of the accelerated development of the north Kona coast and increased stress on its natural and historical resources, Ala Kahakai would provide a means with which to manage this environment, including the adjacent waters and submerged lands.

In prehistoric times, West Hawaii was the island's most populated region, and some villages were occupied continuously until recent times. Traces of these once flourishing settlements still remain and are of immense interest to archaeologists and to

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This section was prepared by Sue Rutka of the Sea Grant Program, University of Hawaii.

Hawaiians intent upon re-discovering their heritage. House sites, agricultural areas, heiaus, salt pans, and petroglyphs provide the most visible evidence of past habitation.

The Hawaiians lived as one with the sea; numerous inland ponds, connected to the ocean by makahas (water circulation channels) were utilized for aquaculture. Hawaiian cultural groups have proposed the renovation of certain ancient fishponds and a revival of the practice of pond culture. Other coastal ponds, fed by both salt and fresh water, were sources of drinking water in this arid and seemingly uninhabitable environment. Today, hikers can cool off in many of these refreshing ponds. Some contain organisms unique to the brackish pond ecosystem and may have to be declared off-limits to swimmers and preserved for scientific study. Opaeula Pond at Makalawena is a refuge for the rare, native Hawaiian stilt.

Ala Kahakai intersects expanses of land covered by old lava flows; this stark, beautiful landscape illustrates the changes wrought by volcanic activity from Mauna Kea, Mauna Loa, and Hualalai. Interspersed throughout the lava are pockets of vegetation called kipukas. Several kinds of indigenous plants can be found, including the rare loulu palm, beautiful maiapilo, hinahina, noni, and ilima.

People interested in a marine experience can snorkel in the many excellent coral reef areas which abound with life. The rocky shoreline along some stretches promises to be perfect for shore-fishing, and several of the beach parks which connect segments of Ala Kahakai are suitable for swimming.

North Kona and South Kohala

The Hawaii County General Plan concludes that recreational areas and facilities in the South Kohala and North Kona districts are generally inadequate. The projected population increase in the South Kohala district and completion of the Queen Kaahumanu Highway will intensify pressures on existing parks, especially Hapuna and Spencer Beach Parks, and create demands for additional recreational opportunities. North Kona is experiencing similar pressures.

The following courses of action recommended in the General Plan relate to the coastal trail concept:

Ensure public use of and access to beach areas in South Kohala.

Establish public access to and the development of shoreline regions along the North Kona Coast so as to provide recreational opportunities in areas such as Keawaiki, Kiholo Bay, Kaupulehu (Kaulupulehu), Kukio and Kapapa Bays, Kua Bay, Kahoiawa, Makalawena, Mahaiula, and Honokohau.

Protect Opaeula, Kaloko, and Honokohau (Aimakapa) ponds as natural areas.

Encourage the development of historic trails.1/

Furthermore, the General Plan regards the coastal zone as an "open area."2/ Open space is "that land which is basically not used for buildings or structures and is characterized by scenic beauty, existing openness, and natural conditions. It is the counterpart of development. Retained in its state of use, open space would maintain and/or enhance the conservation of needed or desired natural, scenic, or historical resources which might otherwise be permanently lost. It would also enhance the present or potential value of abutting or surrounding urban development.3/ The land from Ke-ahole to Anaehoomalu is regarded as a desirable open space buffer between the growing urban areas of Waimea and Kailua. Thus, Hawaii County has committed itself to preserving open areas, and considers public access to the shoreline to be a necessary prerequisite, although not a guarantee, of urban zoning approval. These aimes are consistent with the Ala Kahakai proposal.

While the County controls the use of land in urban, agricultural, and rural districts (subject to the provisions of the State Land Use Law and to the final approval of the Land Use Commission), the State Board of Land and Natural Resources regulates land usage in conservation districts, which comprise 45 percent of the total acreage in the State. Land Board decisions are not subject to review by the County or review by the Land Use Commission; there is no provision for public hearings, in contrast to the administration of the other three districts.4/ The coastal region between Anaehoomalu and Ke-ahole Airport is in a conservation district and, therefore, the Land Board has sole authority to grant or deny special use permits in this area.5/

1/ County of Hawaii, The General Plan, January 1971, P. 66-67.

2/ County of Hawaii, The General Plan, January 1971, P. 66-67. See Land Use Allocation Maps of North and South Kohala District and North Kona District.

3/ County of Hawaii, The General Plan,January 1971, P. 92.

4/ Earl H. Bradley, Jr. and John M. Armstrong, A Description and and Analysis of Coastal Zone and Shoreland Management Programs in the United States, Technical Report No. 20 (Ann Arbor: University of Michigan Sea Grant Program, March 1972). Pp. 208-229.

5/ Petitions may be submitted for unusual and reasonable uses other than those for which the district has been classified. See map on P. 166 in the Hawaii State Comprehensive Outdoor Recreation Plan, 1971, which outlines lands designated for conservation use on the Big Island.

In addition, the specific uses for which State lands (including submerged lands) can be leased are determined by the DLNR. The Department of Transportation also exercises authority over the use of the shoreline and submerged lands. However, flood control and navigational projects in the coastal zone are subject to review and approval of the U.S. Corps of Engineers.6/

There are already many proposals for land development in West Hawaii and urban zoning has been granted for some. The State and County will undoubtedly face increasing pressures in the future from landowners and developers to carry out their plans. For example, Royal Hawaiian Management Corporation holds a 401-acre parcel in the coastal zone just south of Makalawena, and has suggested the construction of a convention center with two high-rise towers. Huehue Ranch is already in the process of developing its Kaloko Pond site, where 80 urban acres are now available for resort use. For its Kukio Bay property, Huehue has proposed three hotels, apartments and condominiums, low-density residential development, open space, a historical park, and a private club.7/

Land Ownership

There is substantial complexity of land ownership patterns in the section to be covered by Ala Kahakai. Fortunately, the State owns large tracts in this region. State, County, and Federal parks would be located at convenient points along the trail system. However, this situation of multiple jurisdictions demands an administrative structure that can coordinate the efforts of the three levels of government and overcome conflicts that may arise.

Rights-of-way would have to be established over segments of Ala Kahakai which lie on private property; negotiations with the owners for access and land acquisition would be major responsibilities of the trail administration. Landholders would be receptive to the Ala Kahakai concept if they were assured of an administration capable of controlling activities on the trail. It is important that the interests of these property owners are adequately represented in the management of Ala Kahakai, especially since many of them would be asked to dedicate portions of their land to the trail system.

As mentioned previously, certain beach resorts may provide services to Ala Kahakai hikers. Likewise, hotels may feature Ala Kahakai as an attraction for their guests; the presence of a

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6/ SCORP, P. 101-102.

7/ State of Hawaii, Department of Planning and Economic Development, Hawaii Tourism Impact Plan: West Hawaii, Vol. II, 1972, Pp. 98-109.

well-managed historical trail system with a good interpretive program would surely enhance the recreational value of the area. Both Anaehoomalu and Kaulupulehu are sites of large and well-preserved petroglyph fields, and these could be integrated into an interpretive program for the overall trail system.

Jurisdictional Conflicts

The State Comprehensive Outdoor Recreation Plan (SCORP) concluded that the diffusion of power and responsibilities for recreation, conservation, and shoreline management "creates major jurisdictional conflicts and cloudy policies. Coordination is expected, but in practice is difficult to achieve."8/ Ala Kahakai's administrative organization would have to be capable of fostering cooperation between various governmental sectors and agencies which may have legal jurisdiction over the trail and trail activities. The following public agencies could have either legal authority over, or a legitimate role in, some aspect or segment of Ala Kahakai:9/

County of Hawaii

Department of Parks and Recreation
Department of Planning

State of Hawaii

Department of Health
Department of Land and Natural Resources/Board of Land and Natural Resources
- Division of Fish and Game
- Division of Land Management
- Division of Parks and Recreation
- Division of Water and Land Development
- Natural Areas Reserve Systems Commission

Department of Planning and Economic Development
Department of Transportation
Land Use Commission
Marine Affairs Coordinator
Office of Environmental Quality Control/Environmental Council
University of Hawaii - Environmental Center, Sea Grant Office, etc.

8/ State of Hawaii, Department of Planning and Economic Development, State Comprehensive Outdoor Recreation Plan, December 1971, P. 94.

9/ For a detailed description of state agency responsibilities, see: State of Hawaii, Department of Budget and Finance, Management Services Division, Plan of Organization: Executive Branch, Hawaii State Government, 2nd Revised Edition, February 1969.

U. S. Government

Army Corps of Engineers
Department of Commerce
National Oceanic and Atmospheric Administration
Department of the Interior
Bureau of Sport Fisheries and Wildlife
National Park Service

Decisions of the State Land Use Commission and Board of Land and Natural Resources would have a significant impact on Ala Kahakai. For example, "up-zoning" or reclassifying private holdings for more intensive use without reference to recreation and conservation needs can price out of the market lands needed for parks or reserves. Government is finding it difficult to pay "development prices" for parcels desirable for public recreational purposes and having potential. Prime examples of this are the Federal Government's efforts to acquire Kaloko Pond and Hawaii County's purchase of Kua Bay. Secondly, reclassification of land adjacent to an existing or planned park may permit a use incompatible with that facility. The probability of this occurring is increased by two factors:

1. State land use criteria do not provide any distinction between areas suitable for multiple uses and those having a delicate ecological balance where use restrictions should be severe.10/

2. Likewise, land in the coastal zone, aside from that included in the 20- to 40-foot setback, is not distinguished from land separated from the marine environment. Recent passage of the National Coastal Zone Management Act indicates that Washington, at least, considers the coastal zone as an entity demanding a management approach unique from that used for non-coastal lands.

According to SCORP, the most serious jurisdictional overlap exists between the State and County parks departments. Because responsibility between the two levels of government is not clearly defined, both may be planning to develop beach parks on adjoining land (as was the case with Magic Island and Ala Moana Park). Although the facilities may function as a unit, both departments have their own maintenance and enforcement personnel, thus increasing operational costs.11/ State and County parks along Ala Kahakai would not be adjacent to each other, but they would be in close proximity and be part of a "unified" trails and parks system. The unifying nature of the trails might suggest the feasibility of

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10/ Hawaii SCORP, Pp. 94-95.

11/ Hawaii SCORP, Pp. 96-97.

a single maintenance and enforcement body for all public facilities along Ala Kahakai and for the trail itself. This alternative will be discussed later. However, it has been proposed that one step toward avoiding duplication of efforts would be the State putting out a contract to the County for maintenance of State parks within that County. The fact that maintenance takes up a considerable part of the State's parks budget points to the need for new ways to cut costs and make efficient use of personnel.

Authority over pollution control is also fragmented between several agencies. While the Department of Health monitors coastal waters and enforces pollution regulations, the Department of Transportation identifies maritime violators and maintains sole jurisdiction over pollution in small boat harbors. Clearing beach debris is the responsibility of the Counties; however, the Counties feel financially burdened by this task. In the case of waterborne debris, such as oil pollution, the Counties do not believe they have the resources or the authority to handle the problem.12/

Some General Guidelines on Trails Administration

All of the factors discussed in the previous pages -- jurisdictional conflicts, land ownership patterns, ecological and historical values, etc. -- will influence the process of designing an institutional arrangement for Ala Kahakai. In an article titled "Institutions for Managing Lakes and Bays",13/ Lyle E. Craine provides a useful framework for conceptualizing these determinants and demonstrating how they influence the nature of an agency. Although Craine is concerned with the factors involved in designing a lake/bay agency and not a trail management system, we are justified in utilizing his framework in the context of Ala Kahakai for several reasons. We are both dealing with marine or aquatic environments subject to various pressures, such as shoreline development and water quality degradation, and suitable for multiple uses, not all of which are compatible with each other. Moreover, we are both concerned with preserving certain natural scenic values along the shoreline. Finally, lakes and bays and a coastal trail network such as Ala Kahakai all demand institutional arrangements to coordinate multi-agency efforts.

The three institutional determinants outlined by Craine are as follows:

1. Environmental (physical, economic, and social) conditions and problems. Within this category we can include the scenic, recreational, ecological and historic archaeological values of Ala Kahakai.

12/ Hawaii SCORP, P. 102.

13/ Lyle E. Craine, "Institutions for Managing Lakes & Bays," Natural Resources Journal, Vol. 11, No. 3 (July 1971), Pp. 519-546.

2. Intervention objectives. This concerns the roles of various governmental jurisdictions, particularly the kinds of intervention powers they may be motivated to enact. As discussed previously, Ala Kahakai's administration would have to be provided with some means to influence the "intervention objectives" of agencies whose decisions may affect the trail system.

3. Political climate. Do the priorities of local, state and national governments recognize the values of Ala Kahakai? Public opinion?

Intervention objectives, conditioned by environmental conditions and problems of the area, as well as by the political climate relevant to its use and development, become the primary determinate of the scope of an agency's powers, which is the basic element in constructing an institutional arrangement. Concurrently, we must consider three other institutional elements of an agency: its geographic jurisdiction, the kinds of operational linkages between it and other governmental units, and the form which the organization will take.

Allen V. Kneese and Blair T. Bower suggest some criteria which regional water quality management agencies should meet based on certain determinants -- technological and economic characteristics of efficient water quality management.14/ Keeping Craine's framework in mind, we can begin to list determinants and criteria for Ala Kahakai's administrative agency.

Determinants	Criteria
Existence of marine and pond eco systems w/varying levels of tolerance.	Trail agency should be able to protect areas w/fragile eco systems.
Water pollution, a consequence of increased use of the shoreline.	
Historic significance of the area; existence of archaeological sites.	Trail agency should have interpretive program; coordinate education/research efforts; establish links w/DLNR, UH, Bishop Museum, etc.
Coral reef and other shoreline areas suitable for fishing.	Trail agency should provide for enforcement of fishing regulations; need to establish links w/DLNR's Fish and Game Division.

14/ Allen V. Kneese & Blair T. Bower, Managing Water Quality: Economics, Technology, Institutions (Baltimore: Johns Hopkins Press, 1968), Pp. 303-308.

Problem of hikers, campers, picnickers and fishermen littering portions of trail not on public land.	Trail agency should designate responsibility for maintaining segments of the trail system between public parks. Work out efficient maintenance program for whole trail system.
Pressures to develop West Hawaii Coast, especially shoreline resort and residential developments.	Trail agency should establish links w/state and county planning agencies, Land Use Commission, Board of Land & Nat. Res. It should be able to protect features within its boundaries.
Multiple constituencies; local residents, Hawaiian culture groups, hikers, conservationishts, private landowners and developers.	Trail agency should provide channels for active citizen

This list of determinants and criteria will be expanded later. After a short discussion of alternative structures which may or may not be able to fulfill these various criteria, we will examine the experiences of others in meeting requirements posed by conditions similar to those of Ala Kahakai.

Alternative Structures: Local, State, and Federal Levels

According to John M. Armstrong, the major issues in coastal zone management are centralization and decentralization. He wrote: "To distribute authority in the coastal zone among the various levels of government involved, we need to invoke the principle of delegation of authority. Under this principle, coastal zone decision making is delegated at the lowest level of government consistent with the scope of the problems, but decisions must conform to the goals and constraints specified by the next higher level."15/

Dr. Armstrong goes on to explain the general roles of levels of government. The Federal government delegates decision-making authority to lower levels insofar as the decisions are consistent with the national interest, and provides monetary and technical assistance. The focal point of coastal zone management is the State, where the planning process takes place. Most of the everyday decisions are made and implemented at the local level.

15/ John M. Armstrong, "The Structure of Management and Planning for the CZ", presented at the Woods Hole National Workshop on Critical Problems of the CZ, Woods Hole Oceanographic Institution, Woods Hole, Mass., June 2, 1972.

Hawaii's State Comprehensive Outdoor Recreation Plan provides certain guidelines which may help in determining the responsibilities of each sector in the recreational sphere.

1. The County Government is expected to serve population centers and provide community rather than resource-oriented facilities. Due to the cost factor, sites tend to be compact.

2. Large resource-oriented environments, often of historical-archaeological significance, are usually the domain of the state government. Services and facilities can be minimal; the assurance of access is sometimes sufficient. Projects which are costly to acquire and develop are more easily administered by the state than by the county. State projects should not be limited to one recreational group but should serve statewide interests.

3. National Park Service knowledge and experience could be relied upon to develop recreational and historic areas; e.g., interpretive programs.

4. Private enterprise should be encouraged to provide supporting facilities within and adjacent to public recreation areas, e.g., budget overnight accommodations, camping sites, "cultural parks", horseback riding, etc.16/

Therefore, the State appears to be the logical governmental unit to administer Ala Kahakai, especially since it is intended as a pilot project for a statewide network of trails. Total management of all aspects of the trail would demand financial resources, institutions, political powers, and a broad range of expertise not generally available at the County level. The State is in a better position to coordinate the multi-agency effort necessary to administer Ala Kahakai. It is also in a stronger bargaining position vis-a-vis private landholders and developers. In addition, much of the trail lies on State land. All of these factors do not necessarily mean that the County and Federal levels would have only minor roles; certain tasks such as trail maintenance may be handled more efficiently at the local level, and Federal technical and financial assistance could prove to be invaluable. The following section presents a survey of what other jurisdictions, at various levels of government, on the Mainland and abroad, have done to organize entities similar to the proposed West Hawaii coastal trail.

16/ SCORP, Pp. 139-143.

What Others Have Done

The concept of unified recreational, scenic, and/or historical trail systems is still relatively new in this country. The New Hampshire situation represents a not uncommon state of affairs in which trails have been developed largely on a piecemeal basis. Although this small State (approximately 9,300 square miles) has no formal Statewide network of trails, it does boast a very extensive foot-trail system which originated more than 150 years ago. Close to 900 miles of trails intersect private lands, and in the State park system there are 65 miles of foot-trails. Out of a Statewide total of 2,000 miles of foot-trails, more than 1,000 miles lie within the boundaries of the White Mountain National Forest. Here, the U.S. Forest Service receives considerable aid in the maintenance of 500 miles of trails from 15 different groups, including the Appalachian Mountain Club and the Dartmouth Outing Club. Throughout the State, these and other private organizations cooperate with public agencies to maintain trails. However, the Director of Parks for New Hampshire, George T. Hamilton, has come to the realization that establishing trails here and there with no sense of direction or set of uniform guidelines and relying heavily on informal arrangements has its drawbacks. He said recently: "Despite our vast network of foot-trails and the fine cooperative spirit which has existed among public agencies and private cooperators alike, there is a need to formalize our approach to the administration of foot-trails and other trails by the establishment of a statewide trails system. The use of all trails continues to mount. The question of what kind of back country facilities should be provided is being reexamined. Protection of trail right-of-way over private lands is increasingly pertinent. These and other factors point up the need for legislative endorsement and support for a network of recreational and scenic trails with state government assuming the responsibility for leadership and coordination in administering a statewide trails system."

Several public agencies have made the effort to formalize their approaches to the administration of trails. The following section will describe these examples in an attempt to derive applications for Ala Kahakai. First to be discussed will be the Federal Government's National Trails System Act and the two National Scenic Trails which have been implemented. Second, statewide trail networks of Tennessee and Washington and the Oregon Coast Trail will be examined. Third is an example of a trail system administered by a local governmental unit. Fourth, the experience of England and Wales in managing parks and footpaths on private property provides an interesting case study. Finally, there is an examination of programs that manage coastal areas which may or may not feature trails but which contain resources similar to those of Ala Kahakai.

National Trails System Act

The National Trails System Act17/, signed into law on October

17/ Public Law 90-543, 90th Congress, S.827.

2, 1968, designated the Appalachian Trail and the Pacific Crest Trail as National Scenic Trails, and proposed the study of 14 potential routes for inclusion under the system. Extending from the Canadian to the Mexican border, the 2,350 mile long Pacific Crest Trail incorporates already existing trails into a unified system administered by the Secretary of Agriculture (in consultation with the Secretary of the Interior), as most of the trails are located on Forest Service lands. The Secretary of the Interior, through the National Park Service (and in consultation with the Secretary of Agriculture) administers the Appalachian Trail which extends 2,000 miles between Maine and Georgia. Advisory Councils are appointed by the Secretaries and are regularly conferred with regarding trail matters.

Appalachian Trail

Administrative responsibilities for the Appalachian Trail are divided among 16 governing bodies of 14 states, the National Park Service, and the National Forest Service. Approximately 34.1 percent of the Trail route traverses federal property, including eight national forests and five areas of the National Park System. Overall responsibility is exercised by the National Park Service, which authorizes the directors of its Northeast and Southeast regional offices to appoint Trail Project Coordinators. Each Coordinator carries out his duties in cooperation with his counterpart in the other region, the Chairman of the Appalachian Trail Advisory Council, and the states. Major decisions are coordinated with the Appalachian Trail Conference, an organization of satellite trail clubs. According to Edgar L. Gray, Chairman of the Appalachian National Scenic Trail Advisory Council, "this arrangement for deriving guidance for and with the other governing bodies has made a very compatible arrangement."18/

As spelled out in the National Trails System Act, membership on the Advisory Councils of both the Appalachian and the Pacific Crest Trails cannot exceed 35 in number, and each appointee serves a five-year term without compensation from the federal government. The Councils review and provide advice on policies and procedures for the administration of the trails and contribute administrative expertise for the resolution of particular problems. Representation on each of the Councils is as follows:

(i) A member appointed to represent each Federal department or independent agency administering lands through which the trail route passes and each appointee shall be the person designated by the head of such department or agency. (The Departments of the Interior and Agriculture

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18/ U.S. Department of the Interior, National Park Service, Appalachian Trail Guidelines, 1971, Pp. 27-29, 10; and correspondence, November 13, 1972.

and the Tennessee Valley Authority are represented on the Appalachian Trail Advisory Council);

(ii) A member appointed to represent each State through which the trail passes and such appointments shall be made from recommendations of the Governors of such States;

(iii) One or more members appointed to represent private organizations, including landowners and land users, that, in the opinion of the Secretary, have an established and recognized interest in the trail and such appointments shall be made from recommendations of the heads of such organizations: Provided, That the Appalachian Trail Conference shall be represented by a sufficient number of persons to represent the various sections of the country through which the Appalachian Trail passes; and

(iv) The Secretary shall designate one member to be chairman and shall fill vacancies in the same manner as the original appointment.19/

Thus, the Appalachian Trail Conference, a private federation of hiking and trail clubs, is legally recognized as having a significant role in the management of the Trail. Established as a permanent body in 1925, this organization coordinated the work of volunteer groups and individuals who had begun the task of constructing trail networks in New England. Through the efforts of the Conference, the Appalachian Trail was initially completed in 1937. Its designation as a National Scenic Trail came after many years of interaction between the Conference and various government agencies. A Memorandum of Agreement between the National Park Service and the Appalachian Trail Conference spells out the responsibilities of the Conference and its affiliate clubs:

1. Continuation of its work in developing, operating, and maintaining all sections of the Trail and related facilities.

2. Coordination with the Park Service of all Trail activities and programs, including mapping, relocation of routes, and the preparation of development plans and of guidelines for trail maintenance, interpretation, and overall management.

3. Erection and maintenance of uniform trail markers provided by the Forest Service.

4. Assisting in land acquisition and negotiation of agreements with landowners.

19/ National Trails System Act, Public Law 90-543, Section 5(3).

5. Encouraging counties, towns, and other governing bodies to adopt land use regulations in order to protect lands adjacent to the trail that are not public owned.20/

During the initial two-year period, the Secretary of the Interior is required to encourage states and local governments to enter into cooperative agreements and engage in negotiations for land along the official trail route. The Park Service may then proceed with establishing cooperative agreements or acquiring land or interest in land for those trail segments not preserved through state action; states and others will still be encouraged to continue their acquisition programs. Moreover, the Park Service is charged with the following responsibilities: (1) providing official trail markers to cooperating organizations and agencies for their erection and maintenance; (2) preparation of information and materials, including press releases, for public dissemination; (3) assisting the states and the Appalachian Trail Conference and clubs; and (4) implementation of the provisions of the National Trail System Act as described in the Appalachian Trail Guidelines.21/

The National Forest Service was authorized by the National Trails System Act to collaborate with the Park Service in the development of trail regulations and to acquire lands within its boundaries that are included in the Appalachian Trail corridor. Sections of the Trail on its lands are administered and maintained by the Forest Service, in cooperation with the Regional Trail Project Coordinators and local trail clubs. Furthermore, the Forest Service is responsible for developing connecting trails and facilities within its boundaries according to established guidelines.22/

The States administer and develop the Appalachian Trail on lands under their ownership and control, in cooperation with the Regional Trail Project Coordinator and the Appalachian Trail Conference, and are required to adopt and enforce regulations and guidelines similar to those employed by the National Park Service. In addition, the States are expected to encourage local governments to do the same for portions of the Trail within their domains. The States also carry on land acquisition programs, assist local governments in their acquisition efforts, establish cooperative agreements, and erect and maintain trail markers. About 22.6 percent of the Appalachian Trail passes through state-owned lands devoted to a variety of uses -- fish and game reserves, parks, forests, water districts, and highways. In certain instances, conflicting management principles have interfered with Trail interests.23/

20/ Appalachian Trail Guidelines, Pp. 30, 40-45.
21/ Appalachian Trail Guidelines, Pp. 28-29.
22/ Appalachian Trail Guidelines, Pp. 29-30.
23/ Appalachian Trail Guidelines, Pp. 11, 30.

Pacific Crest Trail

The Pacific Crest Trail is managed in much the same way as the Appalachian Trail according to the provisions of the National Trail System Act. The Forest Service administers the Pacific Crest Trail in consultation with the Park Service. A notable difference is the lack of a group in the private sector with a strong role comparable to that of the Appalachian Trail Conference. The Pacific Crest Trail Conference was organized to promote the Trail soon after the concept was first proposed in 1932,24/ but this body is not guaranteed by law sufficient representation on the Advisory Council. In fact, the Conference is not even mentioned in The Pacific Crest Trail Guide for Location, Design, and Management.25/ Decisions regarding trail matters are not necessarily made in consultation with the Conference. A 1971 Memorandum of Agreement between the Forest Service and the National Park Service does not acknowledge cooperation with the Pacific Crest Trail Conference, whereas a Memorandum of Agreement in reference to the Appalachian Trail insures the participation of the Appalachian Trail Conference in the administration of the Trail.26/

Eighty percent of the Pacific Crest Trail, compared with 34.1 percent for the Appalachian Trail, is on federally-held lands, encompassing 23 National Forests, seven National Parks, 18 National Forest Wilderness Areas, and nine Bureau of Land Management districts. The Forest Service administers the bulk of these federal lands. Approximately 450 miles of the Trail crosses private property.27/

Oregon Coast Trail

A project that appears to have relevance to Ala Kahakai is the Oregon Coast Trail, which is still in the planning phase of development. This trail system would enable hikers to enjoy the scenic and recreational attractions of nearly 95 percent of Oregon's coastline. Most of the state's 261 miles of ocean beach would be utilized as a hiking route. A preliminary study conducted by the State Parks and Recreation Section concluded that a sectionalized rather than a continuous border-to-border coast trail would be feasible, due to a number of reasons:

24/ U.S. Dept. of Interior, Bureau of Outdoor Recreation, National Symposium on Trails, Washington, D.C., January 2-6, 1971, P. 14.

25/ U.S. Dept. of Agriculture, Forest Service, The Pacific Crest Trail Guide for Location, Design, & Management, May 1971.

26/ U.S. Dept. of Interior, National Park Service, Appalachian Trail Guidelines, 1971, Pp. 39-42.

27/ State Parks & Recreation Section, "Summary of Oregon Coast Trail Feasibility Study".

1. Twenty major water crossings interrupt the route and necessitate long detours or crossing by boat.

2. Private ownership of upland areas where no beach is available for hiking and residential and other developments preclude trail construction.

3. Obstacles to safe beach hiking (high tides, storm waves, drift logs, steep, slippery banks) cut off escape from some beaches.

4. The cost of developing a continuous trail is disproportionately high relative to the few people who may take advantage of such a route for a border-to-border hike.28/

According to Jack Remington, Recreation Trails Coordinator, the Parks Section of the Oregon State Highway Division, in coordination with others in the Division, would be the central administration for the Trail. "Wet sand" beaches, all of which are publicly owned, are regulated for recreational use by this agency. Construction and maintenance would probably be supervised by the Parks Section and by the U.S. Forest Service, which manages about 18 percent of the Oregon shoreline as part of the Siuslaw National Forest.

The Oregon Recreation Trails Advisory Council, composed of eight citizen members appointed by the Governor, would also be involved in the project. It serves in an advisory capacity to the Highway Commission, which is responsible for implementing the provisions of the Oregon Recreation Trails System Act of 1971. This task is carried out through the Parks Section of the Highway Division. Likewise, the Oregon Coastal Conservation and Development Commission would participate in the development of the Trail. Made up of six members appointed at large by the Governor and 24 elected City, County, and Port District officials, the Commission was charged by a 1971 act to study coastal natural resources and recommend their highest and best use through a comprehensive development plan.

Mr. Remington expects participation in planning from local residents, landowners, and hiking groups through the Advisory Council and the Coastal Conservation and Development Commission and through public hearings which are required prior to official designation of any Oregon Recreation Trail. He does not know whether participation by property holders in the actual management of the Trail, other than through the present organizations, will become a factor. However, some arrangement may become necessary to insure acquisition of public rights-of-way through some of the private land.

28/ Correspondence, November 30, 1972.

San-Mateo County Hiking and Riding Trail Project29/

California's "Riding and Hiking Trails Law", enacted by the State Legislature in 1945, provided for a 3,000-mile loop trail from San Diego to the Oregon border. In 1966, the San Mateo County Board of Supervisors authorized its Parks and Recreation Department to establish and maintain feeder trails to the State Trails System. In San Mateo County the State Trails System extends southward from San Francisco to Santa Clara and Santa Cruz Counties, and passes through, or closely adjacent to, state and county parks. The County feeder trails link congested urban areas with these parks, other rural areas, scenic and historic points, and interesting short loop trails. Twelve miles of feeder trails complement the existing 58 miles of trails in San Mateo County.

Two riding and hiking paths give city dwellers convenient access to the countryside: the Lake Trail and the Portola Valley Trail. Originating in the middle of the city of Belmont, the four-mile-long Lake Trail enters a beautiful natural park featuring a small lake, crosses San Francisco Water Department lands and a wooded valley, and finally connects to the State Trail at a point where waters from the Sierras which serve San Francisco converge with the Spring Valley Lakes. The Lake Trail is located on easements acquired by Belmont which, in turn, gave the County the right to construct the trail on these easements. Acceding to a request by the City, San Mateo County agreed to maintain trails within the corporate limits of Belmont. The County was granted a permit by the City and County of San Francisco to construct the trail through its watershed property.

The Portola Valley Trail extends for eight miles from the city limits of Menlo Park through a relatively undeveloped region and connects with the State Trail via an existing County footpath. It is constructed entirely within an existing road right-of-way, part of which lies within the boundaries of the Town of Portola Valley. San Mateo County received permission from the town to establish the trail and assurance that in case the road is widened at some future date, a replacement trail would be provided by the town. Portola Valley also assumed responsibility for maintenance of the trail within its corporate limits and agreed that the level of maintenance would be at least equal to state and county standards. The balance of the Portola Valley Trail traverses unincorporated areas, and the

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29/ The source of information for this section is written material prepared by San Mateo County, including copies of interdepartmental correspondence from the County Engineer and Road Commissioner to the Director of Parks and Recreation, and correspondence between the County and the City of Belmont, the Town of Portola Valley, and the State Land and Water Conservation Fund Program.

County Engineer approved the implementation of the trail over these lands.

Responsibility for the development of the feeder trails project, including the tasks of constructing trails, fencing, and signs, was delegated to the San Mateo Parks and Recreation Department. The Board of Supervisors directed the Building Construction and Engineering Departments to prepare the plans and specifications. The construction of any major bridges is to be undertaken by the Engineering Department.

England and Wales: Land Use and Trails

The casual observer might question the relevance of the English experiences in recreation and land use planning to the Hawaii situation and to Ala Kahakai in particular. However, upon closer examination, certain parallels are suggested. England and Wales compare with the State of Michigan in land area, but their combined population in 1968 of 48.5 million is six times that of Michigan. Although Hawaii's population is not as high nor as dense, the State is undergoing strains associated with the marked increase in population. As Oahu reaches its "saturation point" more and more people are looking toward the open spaces of the Neighbor Islands. England and Wales are facing problems familiar to Hawaii which are creating pressures on the countryside: a decrease in agricultural lands; a sharp increase in the number of automobiles; and an acute housing shortage.30/

As discussed previously, Ala Kahakai could not succeed without the existence of wise land use planning which recognizes the values of the trail and its surrounding resources. Walter L. Criley, Director of the Division of Development Planning, Tennessee Department of Conservation, has warned that we will fall short of a full implementation of the National Trails System Act's provisions unless we develop and adhere to a national land use planning policy. Thus, in addition to studying England and Wale's management of recreational resources, including its system of footpaths, it would be useful to look into its land use program.

The importance of land use policy is highlighted by the fact that in England virtually all land, including those areas designated as National Parks, remains in private ownership. Similarly, much of Ala Kahakai would cross private lands. In the United States, where land is plentiful, large sums of money are spent by the government for acquisition and development of recreational areas, but little or no public control is exercised over the use of a vast percentage of the land in the country. On the other hand, intensive recreational developments in rural areas of England and Wales are rare, and land is controlled by public authorities in ways that

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30/ Warren Johnson, Public Parks on Private Land in England and Wales. (Baltimore & London: The Johns Hopkins Press, 1971), P. 1.

contribute to its amenity values.31/ British parks are simply designated areas in which ordinary rural life is carried on in towns and on farms within the boundaries of the park. The land is not nationalized, and there is no change in ownership. This multiple-use aspect is necessary because of the scarcity of land; huge tracts cannot possibly be set aside solely for recreation purposes.32/ Some 25.3 percent of the land in England and Wales carries some national designation or is proposed for designation, either as a National Park or an Area of Outstanding Natural Beauty. Local governments are also allowed to use designations in their development plans.33/

The National Parks and Access to the Countryside Act of 1949 assigned the major planning responsibilities for recreation to local planning authorities. Every County was required to survey footpaths and prepare maps; these were subject to challenge and revision, after which an official map of rights-of-way was published. The 1949 Act created the Countryside Commission, an ad hoc organization empowered to designate long-distance hiking routes by obtaining rights-of-way and funding their improvement and maintenance.34/ However, the Commission's role is predominantly advisory, and its planning powers and financial resources are severely limited, thus leaving the powers for achieving objectives to the local planning authorities.

Local authorities provide recreation opportunities by: (1) directly providing facilities to which the public has free access; (2) supporting voluntary organizations; and (3) exercising their planning powers. Proposals for recreational facilities must be considered in the context of a broad recreation policy. Moreover, the need for regional planning demands that the determination of this overall policy cannot be conceived of solely in local terms.35/

Virtually all development was brought under the control of local planning officials by the 1947 Town and Country Planning Act, which required that planning permission must be obtained before any

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31/ Warren Johnson, Public Parks on Private Land in England and Wales. (Baltimore & London: The Johns Hopkins Press, 1971), P. xi.

32/ Thomas L. Burton, "Ch. 9: The Org. of Recreation Planning." Recreation Research & Planning: A Symp., ed. Thomas L. Burton. (London: George Allen and Unwin Ltd., 1970), P. 189.

33/ Warren Johnson, Public Parks on Private Land in England and Wales. (Baltimore & London: The Johns Hopkins Press, 1971), P. xii.

34/ Warren Johnson, Public Parks on Private Land in England and Wales. (Baltimore & London: The Johns Hopkins Press, 1971, P. 28.

35/ Thomas L. Burton, "Ch. 9: The Org. of Recreation Planning." Recreation Research & Planning: A Symp., ed. Thomas L. Burton. (London: George Allen and Unwin Ltd., 1970), P. 205.

development could be undertaken. Each County and County Borough (cities within Counties with autonomous governments) is required to prepare a development plan which serves as a partial basis for making land use decisions. Unlike the County general plans in the State of Hawaii which establish official policy, the English County plans provide general direction only. The planning authorities are able to exercise a great deal of discretion, but development plans must ultimately be approved by the Minister of Housing and Local Government, who coordinates planning on a regional and national scale and who has the power to overrule local decisions.36/

Since British national parks are comprised largely of private landholdings and may encompass several autonomous local jurisdictions, their administration differs from that of national parks in the U.S. The Peak Park Planning Board administers a national park on a regional basis. As provided by the National Parks and Access to the Countryside Act, two-thirds of its 27 members are appointed by the constituent county councils and one-third by the Minister of Housing and Local Government. The full Board meets only four times a year; most work is done by committees, which is common in English local government. A staff headed by a director and a planning officer fulfills dual functions:

1. Development control is the Board's major task. Under the provisions of the Town and Country Planning Act, it receives and decides on applications for planning permission. A development plan prepared by the Board is the primary document which guides its activities. Public and private bodies are given an opportunity to review this plan before it is forwarded to the Minister for approval.

2. The Board also implements national park legislation through positive planning and management. About 75 percent of the cost for this function is paid for by the Central Government.37/

In 1967-1968, 71.8 percent of the revenues spent by the Board was received from the constituent Counties and 28.2 percent from the Central Government.38/ The Board has limited funds for improving the physical environment of Peak Park. By using its power to grant or deny planning permission, it fights what is essentially a rear guard action against physical changes in the landscape, while at the

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36/ Warren Johnson, Public Parks on Private Land in England and Wales. (Baltimore & London: The Johns Hopkins Press, 1971), P. 15

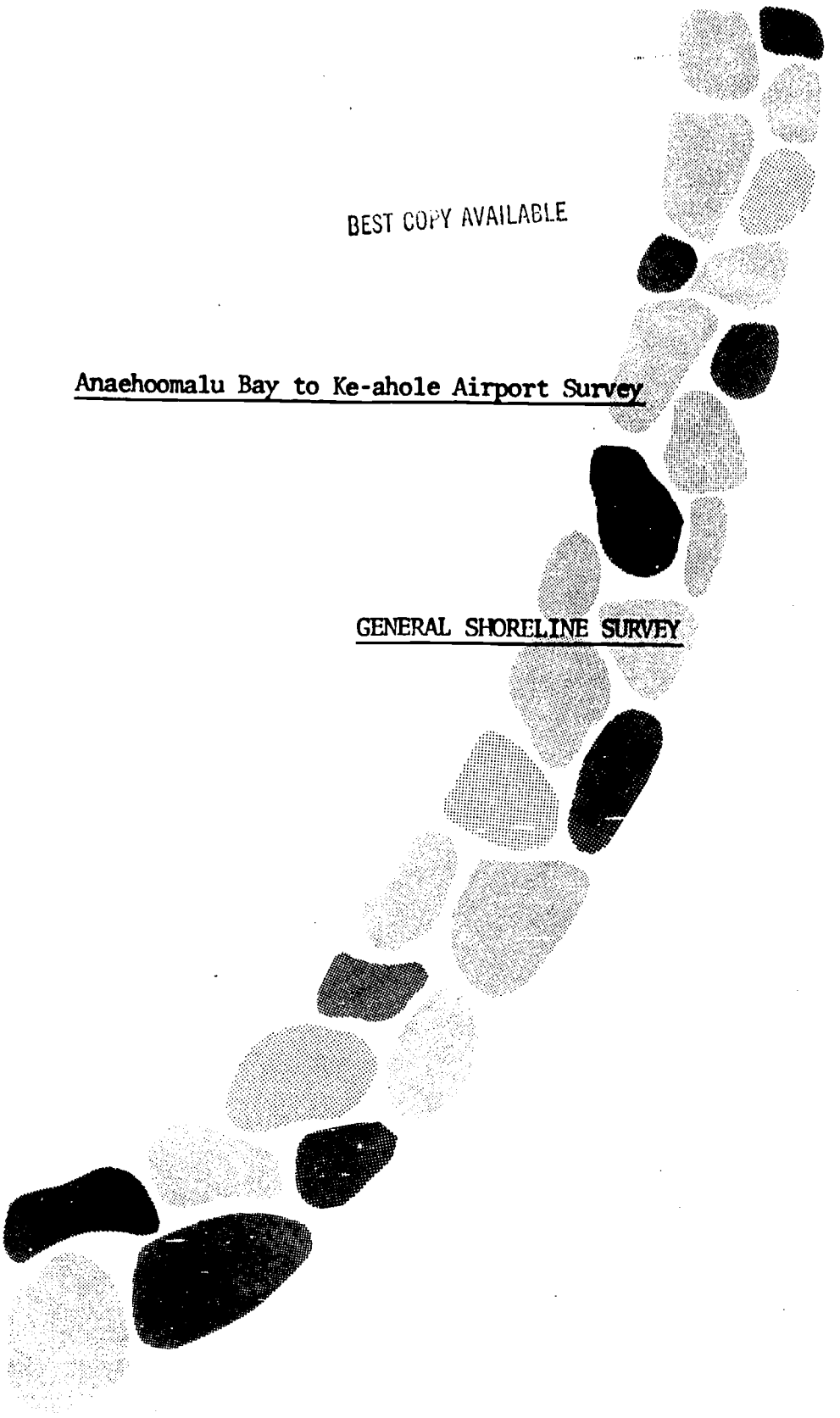
37/ Warren Johnson, Public Parks on Private Land in England and Wales. (Baltimore & London: The Johns Hopkins Press, 1971), Pp. 49-51.

38/ Warren Johnson, Public Parks on Private Land in England and Wales. (Baltimore & London: The Johns Hopkins Press, 1971), P. 50.

same time allowing for legitimate social change.39/

In summary, recreation decisions of the planning authorities in England and Wales are made within the context of general land use policies enforced and administered on the local or regional level and subject to the concurrence of the Central Government. Money and effort are expended less on actually developing amenities than on regulating the quality of the land on which recreational activities are carried out. Ala Kahakai's administration would not have direct control over the use of land and water adjacent to the trail. Its degree of control over land use in the area might have more impact on Ala Kahakai than any other factor, thus necessitating the creation of some mechanism to insure that the trail constituency can provide regular input into the land use planning process.

39/ Warren Johnson, Public Parks on Private Land in England and Wales. (Baltimore & London: The Johns Hopkins Press, 1971), P. 98.



Anaehoomalu Bay to Ke-ahole Airport Survey

GENERAL SHORELINE SURVEY

GENERAL SHORELINE SURVEY

The following report covers observations on marine aspects of the shoreline survey primarily in reference to shoreline descriptions and assessments of shoreline suitability for various ocean oriented activities.

Waiulua Bay

This small, shallow bay is situated about 1/2 mile north of Anaehoomalu Bay and is the site of a proposed boat basin to be constructed by Boise Cascade. According to Mr. Willis Sanborn, General Manager of Boise Cascade's Mid-Pacific Division, two hotels are also planned for construction on or near the shore of this bay. The low south shore of lava bedrock and coral fragments provided easy access to the water and about 40 minutes were spent snorkeling in the bay. In the narrow inner half of the bay, underwater viewing was affected by a fresh water layer at the surface. The bottom was bare lava covered by a thin layer of sediment, but fishes were relatively abundant particularly surgeon fishes, goatfishes and mullet. A large ulua was also seen in the inner portion of the bay. Water clarity was better and corals were more abundant near the mouth of the bay where depths exceeded 10 feet. The entire north shore of the bay consists of jagged aa lava.

Kuualii Fishpond

According to Mr. Sanborn, Boise Cascade has obtained all permits and clearance to dredge the Kuualii and the Kahapapa Fishponds at Anaehoomalu. They plan to commence dredging operations early in 1973.

Anaehoomalu Beach

The stone ledge near the south end of this swimming beach was still present. (Note: The Division of Fish and Game made a survey and fish count in deeper water off Anaehoomalu Beach on October 8, 1970).

South Shore of Anaehoomalu Bay

The shoreline between Anaehoomalu Beach and the south end of the bay is very suitable for swimming and fishing activities. The low shoreline of smooth lava outcroppings interspersed with small pocket beaches of white sand provides easy access to the shallow and calm waters of the bay. Several houses stand at Kapalaoa near the south end of the bay.

Akahu Kaimu

This site is situated about 1/2 mile south of Anaehoomalu Bay and can be distinguished from sea by a clump of kiawe trees and a

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This section was prepared by Richard Kanayama, Aquatic Biologist, Division of Fish and Game, State Department of Land and Natural Resources.

lone coconut tree standing at the edge of a brackish pond. The pond is separated from the ocean by a short pebble beach bounded on two ends by aa lava. Approximately 30 minutes were spent snorkeling off the brackish pond. Fresh water seepage occurred along the shoreline and consequently, underwater visibility was poor for a short distance from shore. The bedrock bottom was barren near shore, but further offshore where depths exceeded about 10 feet, good growths of Pocillopora meandrina and encrusting corals were observed. Surgeonfishes were fairly abundant. The brackish pool provided a convenient place to rinse off after the swim.

Weliweli

Weliweli is the site of a well maintained private residence fronted by a low stone wall and includes a fishpond and a grove of coconut trees all of which are surrounded by aa lava. A coral and basalt rubble beach lies between the stonewall and the sea, and a small boat landing is constructed on one of the lava fingers jutting into the water from shore. The water was shallow and very clear and many yellow tang, pakuikui and other surgeonfishes were seen from the surface. The shoreline between Weliweli and Akahu Kaimu 1/2 mile to the north consists mainly of jagged aa and is inaccessible except at an unnamed bay that had a short stretch of black pebble beach.

Pueo Bay

This bay is situated about 1/4 mile south of Weliweli and contains a 500-foot long crescent shaped beach of black pebbles and coral fragments. Coral fragments deposited far inland along the backshore were indicative of rough seas and high waves that do occur along this section of the coastal zone.

Keawaiki Bay

This bay is about 1/2 mile wide at the mouth. The northern three-fourths of the shoreline is comprised of a broad black pebble beach having a steep foreshore (that part of the beach lying between the low water mark and the upper limit of wave wash at high tide), while the remaining one-fourth consists of low outcroppings of weathered pahoehoe. At Keawaiki, situated near the middle of the eastern bay shore, several houses are clustered south of a coconut tree lined brackish water pond. Lava of the 1859 flow abuts the entire north edge of the pond. Throughout the bay, access to the water from shore is very good.

Kaiwi Point

Kaiwi Point lies at the south end of Keawaiki Bay. The shoreline around this point consists of low, smooth pahoehoe containing numeroud shallow tidepools. The tidepools were devoid of macroscopic algae, but many opae and gobies were present. From Kaiwi Point, vegetation on the coast extends all the way north to Keawaiki,

but none exists to the south until the lagoon in Kiholo Bay.

Ohiki Bay

This bay is bordered by 10- to 15-foot-high lava sea cliffs except for a short section of lava boulder beach at the head of the bay. From Ohiki Bay, pahoehoe sea cliffs extend north for a distance of about 1/2 mile to Kaiwi Point and south for about a mile extending past Lae Hou almost to the north end of the Kiholo Bay lagoon. Along certain sections, smooth boulders line the foot of the cliffs. Access into the water is difficult and hazardous along the cliffs, but certain types of fishing such as surfcasting and possibly spinfishing could be done from the top of the cliffs.

Kiholo Bay Lagoon

This lagoon is situated at the eastern corner of Kiholo Bay and is about 1/4 mile long and about 200 feet across at its widest point. A gravel and boulder spit lies between the west edge of the lagoon and the sea, while the east edge is formed by pahoehoe lava of the 1859 flow. The lagoon opens to the ocean at the south end. Numerous brackish seepages occur along the north edge and water was milky throughout the lagoon. Some fishes seen from the surface included aholehole, mullet and pua, papio, palani, oama, needlefish and manini. A few turtles were also seen in the lagoon and a large manta ray at the mouth.

Kiholo Bay

Most of the south shore between Kiholo and Luahinewai, a distance of about 1-1/4 miles, is comprised of rock outcroppings, coral rubble and black pebble beaches. As indicated on topographical maps, the 18-foot depth contour of a fringing reef extends across the eastern half of the bay about 1/2 mile out from shore. As a result most of the bay is relatively shallow and calm. The Division of Fish and Game surveyed and made fish counts in the middle and outer portions of the bay in October, 1970. Tahitian prawns (Macrobrachium lar) were seen in a small pond in back of the Damon house and also in the makaha of one of the larger inland fish ponds at Kiholo.

Luahinewai

A broad black pebble beach bounded on both ends by aa of the Kaupulehu lava flow fronts the pond at Luahinewai near the south end of Kiholo Bay. The underwater features off the pebble beach were examined by snorkeling. Numerous sea urchins, both the long-spined wana and the short-spined Tripneustes sp. urchins, were seen on the pebble bottom of the inshore zone. Further offshore, coral growth on the hard bottom was luxuriant, expecially along the slopes of a ledge that ran somewhat parallel to the aa shoreline west of Luahinewai. The ledge dropped steeply from a depth of about 15 feet to 40 feet where the bottom changed abruptly to a flat area of silty grey sand. A fish count was made along this ledge during the

October, 1970 survey of the bay by Fish and Game personnel. The bottom of the western end of the pebble beach and along the aa shoreline towards Nawaikulua Point was mainly bare lava rock with many patches and channels of silty grey sand.

Nawaikulua Point

The shoreline around this point is comprised of rough aa lava and access to the shoreline is difficult from the main trail.

Lae Mano

From Lae Mano, the shoreline extending 1/2 mile east and one and one-quarter miles west consists of a broad, pahoehoe ledge that abruptly ends at the sea in three-to-five-foot high dropoffs. Many deep, long crevices have been cut into the ledge and moderate to strong surge occurs in them with each wave. Opihis, some as large as 2-1/2 inches in diameter, were abundant throughout this section of the shoreline. Snorkeling near the west end of the Lae Mano kipuka showed that depths drop to about 10 to 15 feet immediately off the shore. The bottom was lined with boulders and surge zone fishes such as pakuikui, manini, kole, yellow tang, maiko, naenae, etc., were very abundant and quite tame. Coral growth was sparse. Entry into the water and fishing from off the ledge throughout this section of the shoreline would be restricted to calm water periods. A storm-beach of coral and basalt rubble, boulders and sand deposits on the backshore were indicative of high surf conditions.

Shoreline Northeast of Kaupulehu

The shoreline from the west end of the Lae Mano kipuka to Kaupulehu covers a distance of about 1-1/4 miles. The northern half of this shoreline consists of aa lava with a steep seaward face, and therefore there is no ready access to the water. The southern half of the shoreline is privately owned by the Island Copra and Trading Co., Ltd., developers of the Kona Village Resort at Kaupulehu. A gravel jeep road leading from Kaupulehu parallels the shoreline and dead ends at the boundary of the privately owned land.

Kahuwai Bay (Kaupulehu)

The entire northeast shore of this small bay up to and including Mahewalu Point is developed as part of the Kona Village complex. Bungalow-type hotel units have been constructed along the shoreline. A small sand beach at the head of the bay serves as a swimming beach for the resort. Snorkeling to the west of the beach revealed that most of the bottom consisted of bare, flat bedrock which is covered by a fine layer of sediment. Very few live corals were seen and fishes such as manini, palani, pualu, humuhumu and a few weke, kumu, and moano were seen mainly in or around deep cracks in the bedrock. The shoreline west of Kahuwai Bay extends for three-quarters of a mile to Kumukehu Point, and consists of good sand beaches and outcroppings of smooth, worn lava.

Kumukehu Point

The entire shore around this point is comprised of aa lava, and access to the shoreline is poor.

Kukio Bay

Kukio Bay is about 1/4 mile wide and has a narrow sand beach running almost the entire length of the bay. The bottom features of this picturesque bay were examined by snorkeling from the north to the south end covering depths to about 20 feet. The bottom was generally hard bedrock with small sand pockets and sand channels. Corals were primarily Pocillopora meandrina, but these were not very abundant. Fishes were also not very abundant and the water was slightly turbid.

Kikaua Point

Numerous rocks project from the ocean surface off this rocky point which marks the south end of Kukio Bay. A small cove between two rocky projections provides a shallow and protected sand bottomed swimming area. This cove with a sandy beach and a volleyball court on shore is utilized as a picnic and recreational area by the Huehue Ranch.

Kakapa Bay

The rocky shoreline around this small bay is low and access to the clear water is easy. Coral rubble is deposited on the backshore. Two burial mounds stand out prominently on the high bluff in back of the bay.

Papiha Point

The shoreline around this point is also low and rocky. Many rocks are exposed along the inshore zone.

Kua Bay

Kua Bay, situated about mid-way between Kaupulehu and Makalawena, is the proposed site of a county park. This bay has a broad white sand beach and is an excellent swimming area with clear water, sandy bottom and gentle surf.

Kahoiawa Bay and Awakee Bay

Kahoiawa Bay is approximately 1/4 mile wide across the mouth and is situated seaward of the 342-foot-high cinder cone Kuili. Most of the bay shore is rocky except for a short sand and coral rubble beach at the southwest corner of the bay. The bay is shallow and has a rocky bottom.

The shoreline around Awakee Bay is mainly solid rock. This small bay was examined by Fish and Game divers in October, 1971, to investigate a reported sighting of numerous crown-of-thorns starfish in the bay.

Kawikohale Point and Makalawena

A low rocky shoreline extends around Kawikohale Point to Makalawena. The inshore zone is characterized by beachrock shelves that are exposed at low tide, while on shore, beaches of coral rubble and sand occur over the lava bedrock. Tall ironwood trees grow along the shoreline. Snorkeling in the shallow cove south of Kawikohale Point revealed that the bottom was hard, flat and bare, and the water was very turbid. Very few fishes were seen. Another member of the survey party snorkeled further offshore in deeper water, and he reported that the water was clearer and fishes were very abundant. Two fishermen residing at Makalawena were observed with about two gallons of opae ula (red shrimp) which they caught in the rock-lined opae ponds during the night. These opae were for use as palu in opelu fishing.

Puu Alii Bay

This bay has a broad, 2,000-foot-long sand beach backed by vine covered sand dunes. An outcropping of lava bisects the beach and several smaller rocks protrude from the sand along the southwest half of the beach.

Kawili Point

The entire shoreline around this point is rocky and low. Coral rubble beaches lie over the aa bedrock on shore, and numerous rocks protrude from the sea surface along the inshore zone. Two surfers were seen off this point in the mouth of Mahaiula Bay.

Mahaiula Bay

A good sandy swimming beach is found along the entire southeast shore of this bay. The Kona Diving Lodge, a commercially operated facility for divers and comprised of several houses, is situated on this shore. Moderately heavy surf and wave action occurred along the northern shoreline comprised of aa cliffs between 5-to-10-feet high. As a result of wave action and a predominantly sandy bottom, water in Mahaiula Bay was very turbid. The southwest shoreline is mainly low, smooth outcroppings of pahoehoe with small pockets of sand. A shallow shoal area extends about 1/4 mile seaward off the southern tip of the bay.

Makolea Point

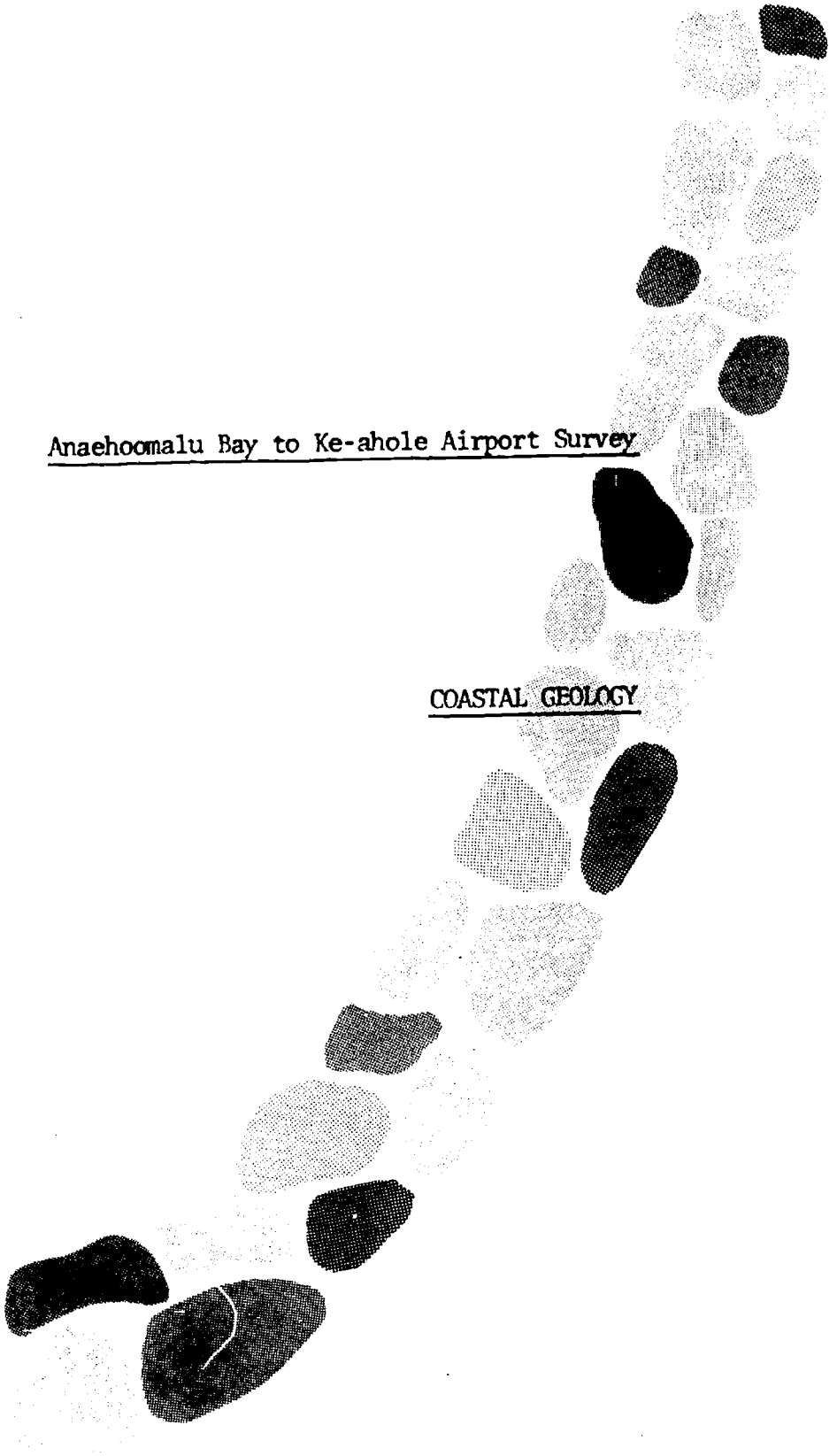
From about 1/4 mile south of Mahaiula Bay to Ke-ahole Point, a distance of approximately four miles, the shoreline consists of barren pahoehoe lava of the 1801 flow. The lava ends as 5-to-10-foot high sea cliffs at the shoreline and access to the water is generally poor throughout this section. A small black sand beach exists just north of Makolea Point. Snorkeling off this beach revealed a rocky boulder covered bottom with an abundant population of surge zone fishes that appeared very tame. From Makolea Point, the shoreline

was followed south for approximately 1/2 mile, then the survey party headed mauka to meet a jeep road that connects Mahaiula with the Ke-ahole Airport. This jeep road was followed to the airport to end the survey.

Summary

The coastal zone covered by this survey was mainly undeveloped and uninhabited. Exceptions were the large Kona Village Resort complex at Kaupulehu and a small commercially operated diving lodge at Mahaiula. Also, private houses were seen at Kapalaoa in Anaehoomalu Bay, Weliweli, Keawaiki, Kiholo and Makalawena, but most of these were beach or vacation-type homes and were unoccupied at the time of the survey. At Kikaua Point south of Kukio Bay, a small recreational beach with a volleyball court and picnic area has been built on land owned by the Huehue Ranch. It should also be noted that further commercial development of Waiulua Bay and the Anaehoomalu Beach area is impending.

The coastal zone features many miles of excellent shoreline for fishing, swimming and other ocean oriented activities. The public, however, does not presently utilize the shoreline to any appreciable extent mainly because access from inland areas is lacking. During the five days of the survey, only four fishermen or groups of fishermen were seen along the approximately 18 miles of shoreline. These included a pole-and-line fisherman at Kaupulehu, a gill-net fisherman at the mouth of the Kiholo Bay lagoon, two opelu fishermen at Makalawena, and a group of spearfishermen diving from a boat anchored off Kawili Point. At Kiholo, a skiff entered the bay and landed near the mouth of the lagoon, but it was not determined if the occupants were fishing. Implementation of the Ala Kahakai proposal would be beneficial and desirable in terms of providing access to the shoreline for public utilization and enjoyment.



COASTAL GEOLOGY

The trail between Anaehoomalu Bay and Ke-ahole Airport, and down to the old Kona Airport, provides interesting geological features to be seen by visitors, hikers and others in the area. This report will not fully detail the geology of this region, but rather point out the highlights and features.

From various places along the trail the hiker gets good views of Mauna Loa, Hualalai, Mauna Kea, Kohala Mountain and Haleakala. For example, from a point on the south side of Pueo Bay the visitor can view the northwest rift zone of Hualalai with its associated puu's or cinder cones; the summit of Hualalai, if the weather is clear; Puu Waawaa and the Puu Anahulu flow that is associated with it; the course of the 1859 Mauna Loa lava flow, on which the visitor stands; Mauna Kea and some of the puus on its flanks; Kohala Mountain and some of the puus along its northwest rift and, across the water, Haleakala on the Island of Maui. All of these are of interest; for example, the 1859 Mauna Loa flow is the longest and probably the largest in volume of the historic lava flows in Hawaii. It started at an elevation of 9,200 feet on the north flank of Mauna Loa and went 33 miles to enter the ocean in North Kona. The eruption lasted 300 days and produced 600,000,000 cubic yards of new lava above sea level. According to Hawaiian tradition, this flow buried a number of interconnected fishponds that extended north from the pond at Kiholo.

The Hawaiian people had a very close relationship to nature and the land, and many of their personal names and place names had to do with natural events and geologic phenomena. A good example found along the trail is Kaulupulahu, presently called Kaupulahu, where, legend says, Pele punished a woman for not giving her some breadfruit (ulu) that she was cooking over an open fire (pulahu). Pele sent down the lava flow north of the present place of this name. This is part of the northern branch of the last eruption of Hualalai that occurred in 1800-1801. It can be theorized that this event and the legend used by the Hawaiians to explain it caused the name of this area to be changed, or possibly a new story was made up to go with a pre-existing name to explain this latest lava flow.

Aside from the panoramic views and their associated large scale geologic features, there are many smaller scale volcanic features that can be seen on or close to the trail. Puu Kuili, a cinder cone on the northwest rift zone of Hualalai, is only a short distance from the coast and marks the site of a prehistoric eruption in this area. On a smaller scale can be seen the different types of lava flows commonly found in Hawaii. The trail passes over aa flows with their typical clinkery surface and accretionary lava balls.

This section was prepared by J. Frisbee Campbell, Geophysicist, University of Hawaii Institute of Geophysics.

In places where the sea has eroded into the aa flows, the internal structure of the flow can be seen with clinker on the surface overlying a massive, relatively dense interior that covers a lower clinker layer. The lower clinker layer is formed by clinker falling off the front of the flow and being buried by the flow as it advances.

The pahoehoe flows crossed by the trail exhibit a wide range of features that are common to this type of flow. The surface texture ranges from the smooth ropy surface of the 1800-1801 flow near the new Kona Airport to the extremely broken up, spiney surface of the flow just south of Kaloko. Surface features such as tumuli, pressure ridges, driblet spires and pahoehoe toes are common. Lava tubes are visible in all the pahoehoe flows and vary in size from a few inches to many feet in diameter.

Aside from the volcanic features there are other geologic features related to the wind and the sea. At the southwest end of the sandy stretch of coastline near Makalawena are some good examples of sand dunes that extend approximately 700 feet in from the beach. These dunes are covering the lava flow and some of the keawe trees in the area are partially buried.

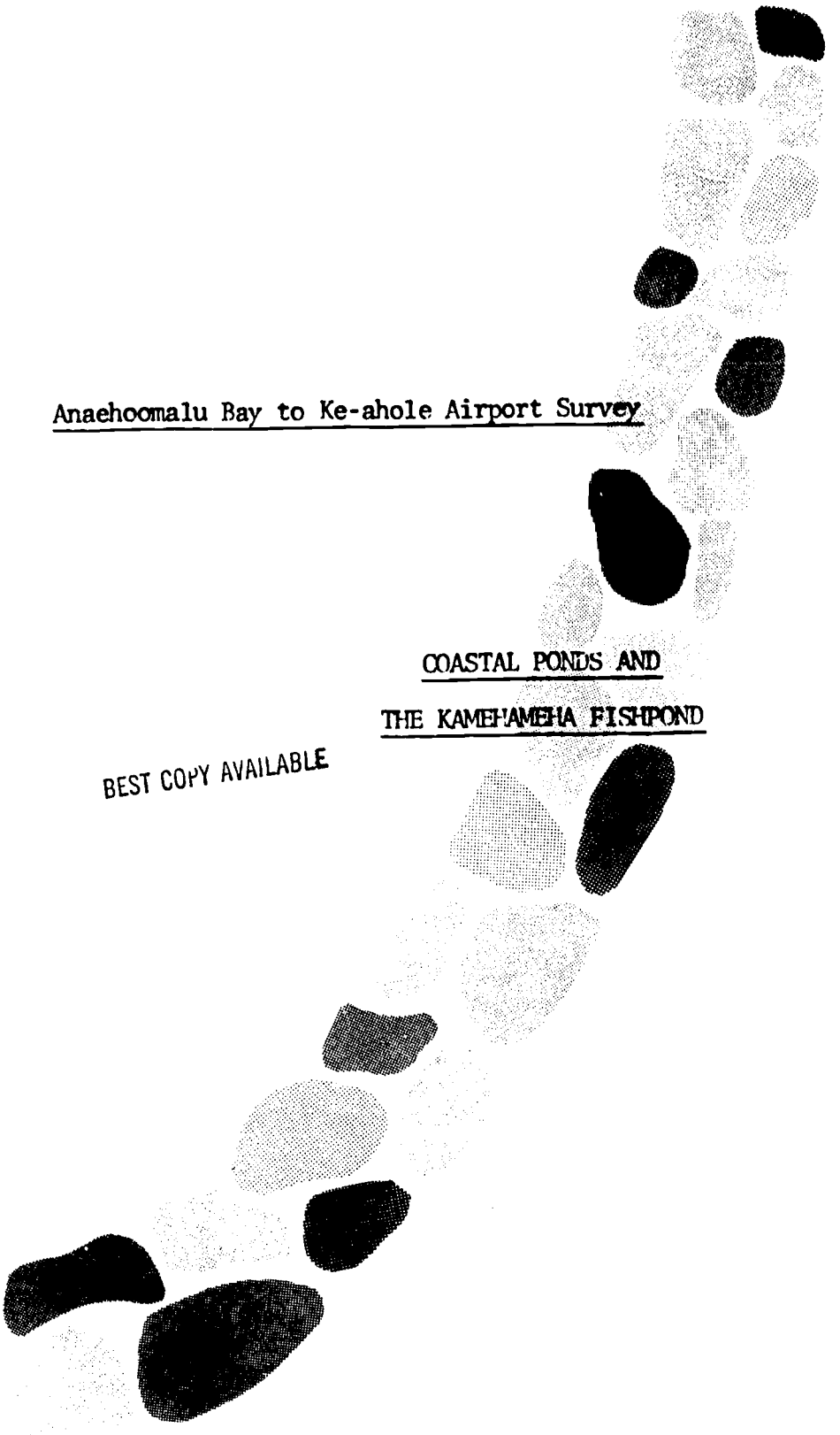
More spectacular than the features derived from the work of the wind are the features resulting from the work of the sea. Sea cliffs, stacks, arches and blow holes are common along some sections of this coast. There are a few beaches with sand ranging in color from black to gray to white and there is a small pocket beach of green olivine sand south of Anaehoomalu. There are also many pebble, cobble and boulder beaches. Beach rock, a rock made of cemented beach materials that forms under the beach face, is seen in many places along the shore indicating that the beaches have retreated from a more seaward position. The beach rock outcrops at Makalawena and Awakee are very spectacular as they rim nearly the whole bay.

The storm beaches that are fairly common along this coastline are very interesting. These are beaches, with material ranging in size from sand to boulders, that are found from a few tens to a hundred or so feet back of the shoreline. Seeing these storm beaches along a coast where the ocean is usually quite calm forces one to wonder how they came about. Because this coast has no protection from the Kona storm waves that come from the west and southwest, and the water is deep right off most of the coast the full force of the storm waves is expended along the shore. During these storms large masses of water are thrown up onto the shore, in some places over sea cliffs 10 to 20 feet high, and form the storm beaches.

Other interesting geological features are the coral reefs that are present in places off this shoreline, the brackish ponds and freshwater springs that were able to supply water for a large population, a natural lagoon and the kipukas that are crossed by the trail and seen in the distance.

Anaehoomalu Bay to Ke-ahole Airport Survey

COASTAL PONDS AND THE KAMEHAMEHA FISHPOND



COASTAL PONDS AND THE KAMEHAMEHA FISHPOND

Due to a combination of geographical and geological factors, there are many coastal ponds along the West Hawaii, or Kamehameha, coast. The ponds vary in size from a few tens of square feet to several acres in surface area and from a few inches to twenty or thirty feet in depth.

The conditions that favor the creation and preservation of these ponds are: the geographic position of this coast in the rain shadow of Mauna Kea and Mauna Loa, the recent age and permeability of the lava flows, the normal surface relief of Hawaiian lava flows and the relatively gentle slope of the land.

Most of the ponds originate because the surface relief of the flows in the coastal area may be greater than the elevation above sea level. The high permeability of the rocks allows any depression that is below sea level to fill with water. Some of the ponds were created by beaches that formed along originally irregular flow fronts. Ponds are found where there were indentations in the flow front. There are also some ponds that were man made. Ellis describes Kiholo in 1923: "A small bay, perhaps half a mile across, runs inland a considerable distance. From one side of this bay, Kamehameha built a strong stone wall, six feet high in some places, and twenty feet wide, by which he had an excellent fishpond not less than two miles in circumference." Most of this pond was buried by the 1859 Mauna Loa lava flow. Kaloko may be another example of a man-made pond.

By present standards there are no ponds that contain potable water. However, most of the ponds are at least partially fresh due to mixing of sea water with a small groundwater lens. In the past this brackish water supported a large Hawaiian population.

The low rainfall, about 10 inches per year, and the high permeability of the lava flows produces a condition in which there is very little surface runoff. This with the unweathered condition of the young lava flows, prevents rapid filling of the ponds by sediments that are derived from erosion of the land.

The present value of these coastal ponds is mainly aesthetic and possibly scientific. Aesthetically they are a pleasant and sometimes green oasis along a coast of barren lava terrain. Scientifically they are of interest for their unique biota and also for the historical role they played in the life of the Hawaiians.

Aside from the historical significance of some of the ponds

This section was prepared by J. Frisbee Campbell, Geophysicist, University of Hawaii Institute of Geophysics.

there is little that sets them apart from other coastal ponds found in the State. However, their small size makes them very susceptible to pollution. The porous nature of the rock surrounding the ponds helps to keep them clean but the amount of pollutants that they can absorb is very limited.

The Kamehameha Fishpond

The Kamehameha fishpond at Kiholo was described in 1843 by Lorenzo Lyons as, "... one of the artificial wonders of Hawaii; and immense work! A prodigious wall run through a portion of the ocean,..." (Kelly, 1972.) William Ellis, quoted above, also was impressed.

As mentioned, the 1859 Mauna Loa lava flow is said to have filled this large and historically significant structure. However, a recent investigator has suggested that although most of the pond was filled by this flow, part of it remains (Kelly, 1972). This interesting hypothesis cannot be confirmed without excavation. From Ellis's description, it would seem that were a portion of the wall found, it could be easily identified.

Assuming that a part of the Kamehameha fishpond remains, we now need to determine the probable location and orientation of the pond wall. Kelly has suggested that the pond along the southern margin of the 1859 lava flow is all that remains of the Kamehameha pond and that the peninsula fronting this pond is probably a remnant of the wall. Based on known descriptions of the pond and a consideration of the nature of lava flows, an alternate location is proposed. This is that the ponds back of the beach are the remains of the Kamehameha fishpond.

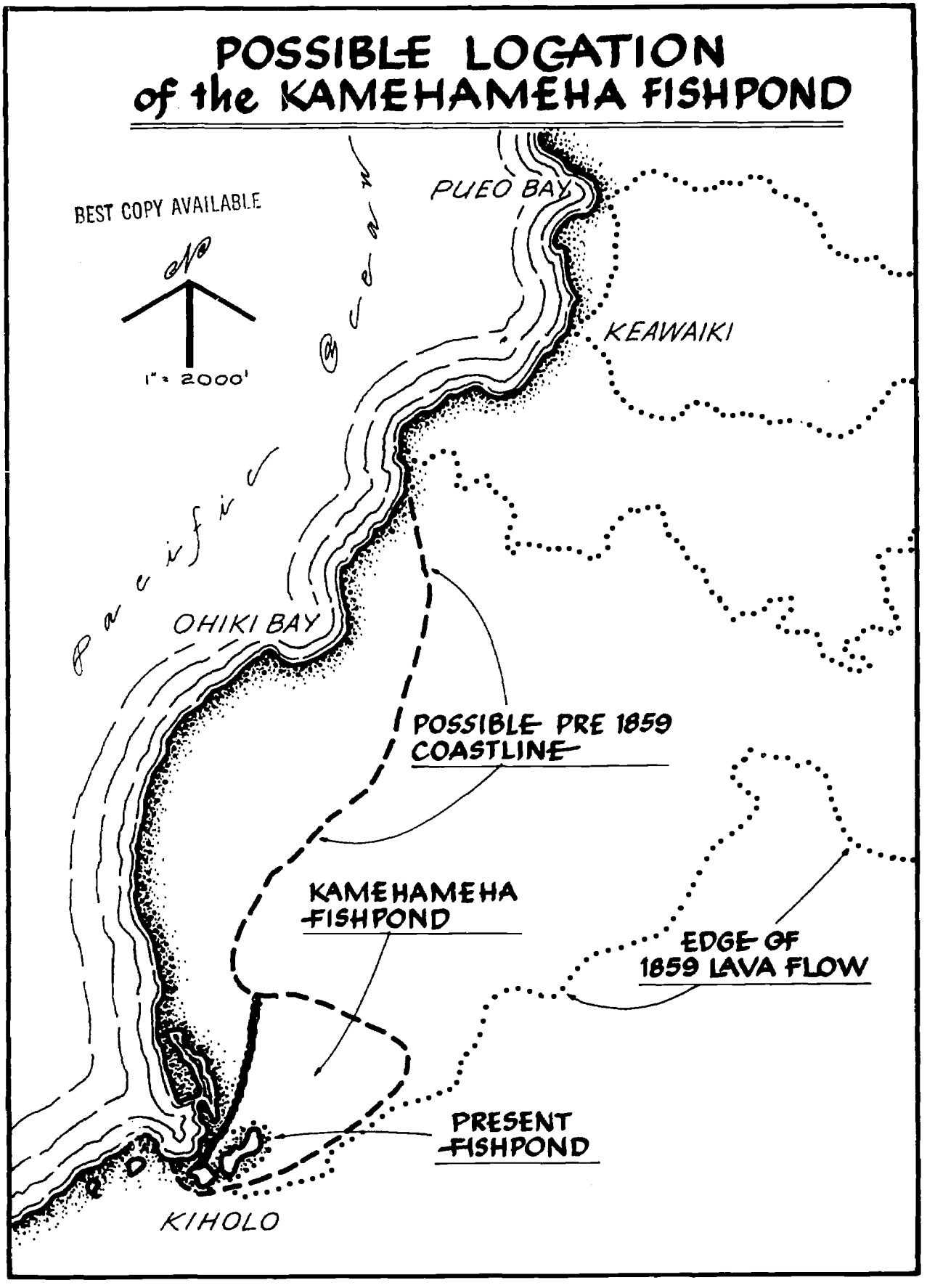
To have a wall half-a-mile long as described by Ellis, the spit fronting the seaward pond would have to be more than double its present length, and a bay extending inland from this wall would be essentially parallel to the general trend of the shoreline in this area. Two other factors make suspect the proposal that this pond is the original Kamahameha pond: the depth of the pond, which is much deeper than normal for fishponds, and the fact that all this area is associated with land that was probably created by the 1859 lava flow.

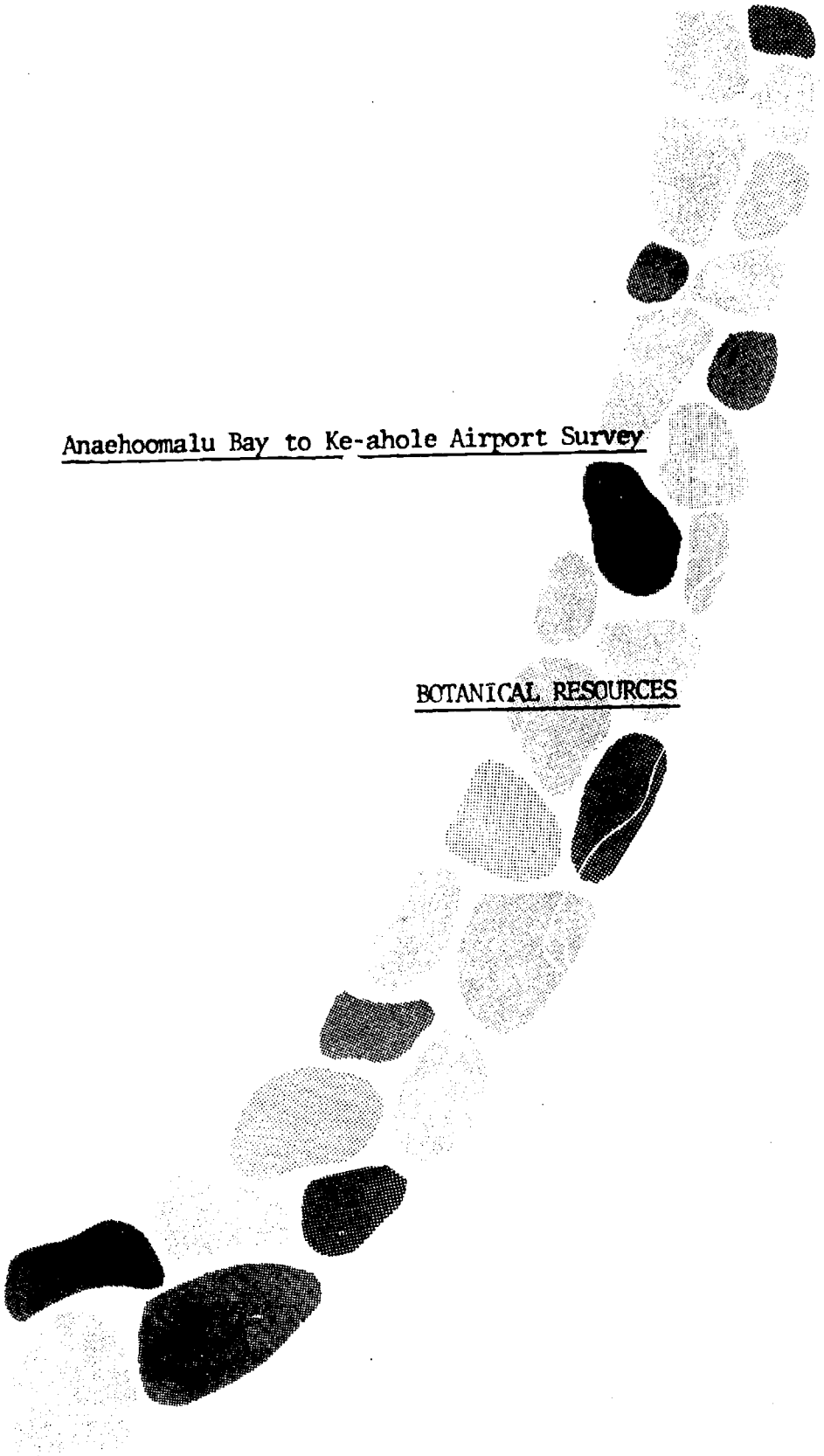
Normally lava flows will seek out pre-existing lows in the topography and thus will very often enter the ocean where a bay marks such a spot. A look at the course of the 1859 flow shows that it split into two branches. The northern branch entered the ocean just north of Keawaiki and formed the headland between Puao Bay and Keawaiki. The southern branch came down towards the present Ohiki Bay and also spread in a southerly direction. Since the area covered by the southern branch is fairly large, it is virtually impossible to reconstruct the pre-flow shoreline with any degree of certainty; however, it must have been a relatively low area. It is reasonable to assume that the southern branch of the

flow entered the ocean near Ohiki and then, as the flow front built out into the ocean and was cooled, it moved southward along the low portion of coast. Other evidence that much of the coastal area of the 1859 flow is new land is seen in a quotation from Isabella Bird. While discussing lava flows with the Reverand Titus Coan of Hilo, a Hawaii resident since 1835, he told her of the 1859 Mauna Loa eruption, "This eruption ran fifty miles to the sea in eight days, but the flow lasted much longer, and added a new promontary to Hawaii." (Bird, 1964)

The sketch with this section shows one possible reconstruction of this coastline prior to the 1859 lava flow. This reconstruction is based heavily on the description of the pond given by Ellis; the pond area and length of the wall are essentially as he described them. This reconstruction also allows for a promontary where there was once a large bay. It is interesting to note that a wall across Anaehoomalu Bay from the point just north of Kapalaoa to Anaehoomalu Point would form a pond very similar to this reconstruction of the Kamehameha fishpond.

Since Kiholo is to be a State park, further research into this matter seems justified. It is possible that maps made prior to 1859 exist in the State Surveyor's office. If Titus Coan kept a journal, as did most of the early missionaries, it may have further descriptions of the pond. Bird says that Coan made a trip around the Island of Hawaii in 1835. Since the walls of the presently existing ponds have been covered, geological and geophysical techniques could be used to locate them.





Anaehoomalu Bay to Ke-ahole Airport Survey

BOTANICAL RESOURCES

BOTANICAL RESOURCES

This section is concerned with plant life unique to the 30-mile stretch of the Kamehameha Coast along which the proposed Ala Kahakai would go. Included are plants that occur there because of introductions by the Hawaiian people long before the first Europeans arrived on the scene, and plants which have naturalized recently or exist only as ornamentals. An attempt will be made to assess the interest or value these botanical resources may have to the landowner and visitor.

The writer has benefitted from a knowledge of the rich native coastal vegetation of Kaena Point, Oahu, and from two months of field work in the impressive dryland sclerophyll forests along the main highway through the ahupuaa of Puuanahulu and Puuwaawaa. Still, this report must be regarded as provisional in every respect. After only a single walking tour by one partly qualified observer, an authoritative report cannot be made. More visits must be made by vegetation ecology specialists.

The Leeward Littoral Environment

For plant life along the coast of West Hawaii, water is in scarce supply, the sunlight is strong, temperatures are high and a roothold in the sands is unstable. In this land of extremes, living things survive only with modifications of their usual forms and functions.

Lying to the leeward of the highest mountain masses in the State, West Hawaii is blocked off from the moisture-laden trade-winds. The climate of Kawaihae can be classified properly as desert; its seven inches of average annual rainfall is only five percent of what Hilo receives yearly. As the hiker moves south toward Honokohau, the climate slowly moistens. At Kailua enough moist air moves mauka off of the ocean and condenses to produce convection showers that the precipitation climbs to 40 inches annually. In Puna and Hamakua where the full benefit of the northwest trades is received, a forest of ohia, hala, and hau extends right down to the beach line. Thus, (except on new lava flows) the paucity of the arborescent flora on the leeward coast is directly attributable to dryness.

The brilliance of illumination of the Hawaiian strand is one of its most distinctive features. On coral beaches the intensity is greatly increased by reflection, and the glare at midday can be as intolerable as that from a snowfield. Too great a light intensity can retard or even cause cessation of plant growth. Internal reactions result in shorter distances between leaf nodes and coloring of leaves becomes yellowish-green or gray.

This section was prepared by Steve Montgomery, Natural Areas Specialist, State Department of Land and Natural Resources as a half-time member of the State Natural Area Reserves System Commission.

As any barefooted hiker knows, the upper layer of sand on the beach becomes quite hot under a clear sky, typically up to 110 degrees and even 120 degrees.

Wind is a powerful agency in its direct mechanical effects upon beach vegetation. It is not coincidence that many strand plants have forms that are protective, being hemispherical or rosette-shaped or else creeping in habit. The mechanical effect of the wind is greatly augmented on those coasts where it is able to pick up quantities of beach sand. Tough and wiry plants are favored during storms, when the wind becomes a veritable sand-blast. A combination of winds, brilliant sunlight and high temperatures greatly accentuates dryness because moisture is all the more rapidly drained from a plant.

Three Plant Communities

There are three basic habitats for terrestrial plants encountered along this coast. The sand beaches and dunes support the pohuehue mat and the naupaka thicket communities. Low-lying brackish ponds support the akulikuli marsh community, and the lava flows support the kiawe forest community. Each will be discussed by enumerating its component species in a following section.

The Pohuehue Mat Community

Reaching almost into the sea are runners of the pohuehue or beach morning glory. They grow up to 100 feet long, and can serve as tough cordage, or be twisted into coils to be used for driving fish into nets. The foliage smells like that of the sweet potato, to which it is related. In fact, the roots and stems could be cooked and eaten in times when regular foods were scarce, but if eaten for any length of time, the pohuehue causes dizziness. Also, its typically morning glory-like flower gives rise to seeds that served in early Hawaiian culture as a cathartic or purgative.

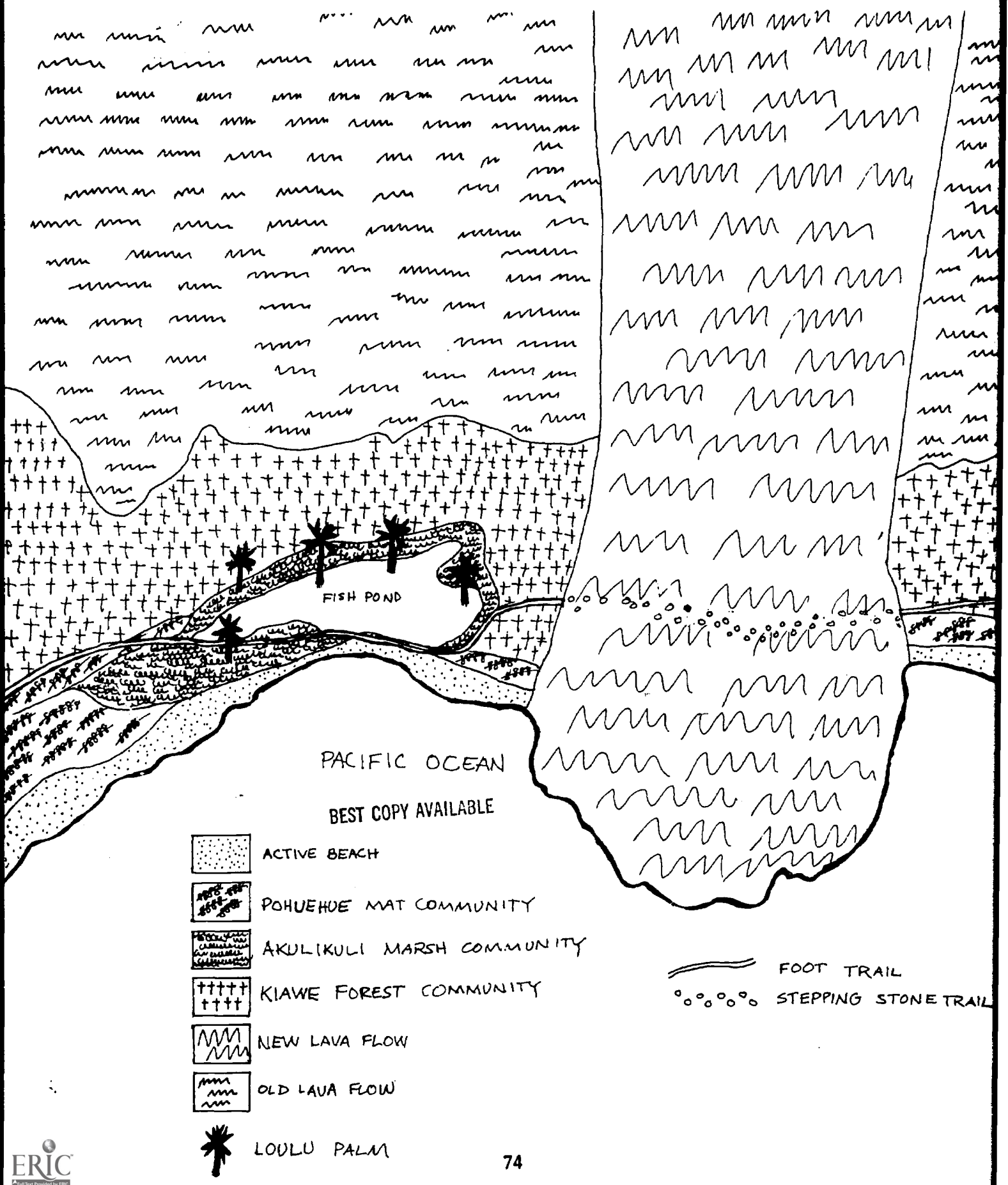
Bees can be seen visiting not only the flowers but also a pair of tiny, dark, fluid-secreting glands at the base of the leaves.

Because its seeds can travel by floating for long periods in ocean currents, this plant grows naturally on tropical shores around the Pacific. One convincing experiment on this method of spreading was done in Hawaii 70 years ago by Dr. H. Guppy, who showed that beach morning glory seeds will grow after floating in sea water for 1-1/2 years!

Botanists everywhere know it by the Latin scientific name, Ipomoea pes-caprae. The plant is so named because a cleft at the end of each leaf likens it to a goat's foot.

Occasionally, the hiker will come upon a mat of pohuehue half-smothered under a great, tangled mass of what looks like orange chow mein noodles. He has found the kauna'oa (Cuscuta sandwichiana), an endemic relative of morning glories that has given up its green

A SKETCH-MAP OF PLANT COMMUNITIES ON A TYPICAL WEST HAWAII COASTLINE



pigments, roots and most of its leaves in favor of a parasitic life. Tugging at a handful of its stringy stems shows it to have scores of sucker-like attachments to its host. The kauna'oa sometimes draws out enough sap to cause a localized anemic or wilted look, giving it one of its English common names: stranglerweed. Other names are love-vine, dodder, and pololo. A botanist on the Mainland untangled from its host a single plant of dodder there, and after measuring it came up with a total stem length of 800 yards or one-half mile!

In his youth, Alika Cooper says he watched old women in Puna gathering skirtfuls of kauna'oa and putting it into tide pools. Then they hit the water to scare the fish enough so they squirmed into the kauna'oa for refuge, where they were easily caught.

In regard to uses of this plant, Dr. Otto Degener writes that in the 1930's, at Kailua-Kona, he observed Hawaiians sacking kauna'oa to carry it home as food for their pigs. Much better known is its use in lei-making, for which it is pulled up and twisted into shape. It makes an attractive hat-band, lasting several days even if worn in the sun. In 1932, the kauna'oa was named the flower emblem of Lanai.

The most impressive morning glory is the Hawaiian moonflower (Ipomoea tuboides) which has large, white, night-blooming flowers. It is unfortunately rather rare, but it can be seen sprawling across the huge lava chunks on Kaiwi Point near Kailua, or climbing over naupaka bushes on the North end of Anaehoomalu Bay.

Naupaka-kahakai (Scaevola taccada) is a characteristic plant of the sandy beach, along rainy coasts forming whole thickets, though drier districts tend to have fewer and much smaller clumps. The leathery, light green leaves form dense rosettes at the tips of branches, and often packed in among them are plenty of pithy white fruits that can be readily floated about on ocean currents. The naupaka's odd white flower appears as if one side of it was cut away. This "half-flower" is explained by one Hawaiian legend as having resulted from the separation of two lovers when the man was forced to depart for war on another island. On taking leave, he tore a naupaka blossom in half, saying: "When the flower is whole again, I shall return". To this day, the naupaka flower is seemingly only half a flower as a sad reminder that the man never returned from battle.

The hinahina (Heliotropium anomalum) stands out in widely scattered low clumps because its leaves are completely covered with reflective, silver-gray hairs.

Interestingly, another well-known hinahina growing in arid, sunny (but often cold) habitats bears the same type of "fur coat": the silversword.

The vegetative mat that holds down sand dunes in Kona includes

a few other plants, such as the alena (Boerhavia diffusa). The common name means "light yellow" in reference to the color of its fleshy root, said to have been a part of the ancient materia medica because of its drastic properties. (Specific instructions on the preparation and use of many local plants can be found in Hawaiian Herbs of Medicinal Value by D. K. Kaaiakamanu and J. K. Akina, first published by the Board of Health in 1922 and now reprinted by Pacific Book House.)

The leaves and flowers of the low-growing alena are small and inconspicuous, making it typical of the several "belly plants" that are best discovered by careful searching on hands and knees.

The nohu (Tribulus cistoides) is only rarely encountered in this part of the Big Island. Perhaps fortunately so, because the spiny seed capsules of the nohu or "puncture vine" (as it is just as often called) can be painful to the hooves of four- and two-legged animals. Capsules are spread when caught in the fleece of sheep or other stock. The conspicuous, fragrant, yellow blossoms last two days, closing during the night.

The akulikuli (Portulaca lutea) is a prostrate, succulent plant whose stems can break easily if stepped upon. It is not common. The kolokolo-kahakai (Vitex trifolia) is a foot-high shrub with clusters of purple blossoms at the end of its branches. The leaves and stems are covered with fine, velvety hairs. The aromatic smell of a crushed leaf belies its kinship to lantana.

The Akulikuli Marsh Community

Clumps of tree-sized vegetation seen in the distance along the coast tell the traveler that he is coming upon a Hawaiian oasis. Perhaps it is a fishpond fashioned by men long ago, or else a natural depression in the rock or sand dunes where fresh water emerges from the earth just before meeting the sea. One who knows will drink carefully from a quarter-inch surface layer for the freshest water, especially while the tide is going out.

Characteristic of these brackish water sites are the akulikuli (Sesuvium portulacastrum), the kipukai (Heliotropium curassavicum), the ohelo-kai (Lycium sandwicense) the makoloa 'ahu'awa (Cyperus laevigatus) and the Australian salt bush (Atriplex semibaccata). The clumps of trees include kou, milo and coconut, all brought by the discoverers of these islands centuries ago, and the hala and loulu which apparently arrived by their own devices. The velvet leaf Messerschmidia has been introduced recently.

The Kiawe Forest Community

At Puuwaawaa on West Hawaii, the hardiest trees of the dry land forest, wiliwili and uhiuhi, grow only as far makai as 600 feet above sea level. On the slopes below this grows only kiawe (Prosopis chilensis) because it has an extraordinarily efficient water-drawing

ability in its roots which it developed in the Chilean desert of South America. Within 100 years the descendants of the tree planted by Father Alexis Bachelot in Honolulu in 1828 covered 90,000 acres of low-lying, arid lands that previously had little tree-sized vegetation. The trees are valued because at maturity they annually bear an average of 200 pounds of seed pods useful as livestock food. However, some observers suspect many other plants have been competitively eliminated and waterholes dried up by the efficiency of its roots. Very probably pockets of soil now covered with kiawe were the sites used for sweet potato and gourd cultivation. The archeological and ethnobotanical studies of Francis Ching and Craighill Handy reveal a surprisingly extensive settlement of this kekaha-waiole (desolate land without water).

Some Comments on Management

In the fishponds nearer to urbanized areas, the vegetation of fishponds has changed drastically. At Kaloko, the introduced pickleweed (Batis maritima) forms a monoculture around the pond and at another pond at Aimakapau mangroves are choking it to such an extent that the buildup of leaf litter is undergoing anaerobic decay. Specialists in vegetation management should be consulted to avoid further deleterious changes in these places and elsewhere along the proposed trail.

Many of the same trees planted when large populations of Hawaiian people inhabited the coast could be nurtured by a landowner wishing to develop a site. Kou, milo, loulu, kamani and hala all could form more a part of the scene. The loulu growing right out of the fishponds, pools and marshes from Kapalaoa to Kukio is believed to be unique to that region. All of its relatives are either high in the mountains or on remote islands like Nihoa. As one arrives at Parker Ranch Beach, he is greeted with beautiful plantings of the endemic maiapilo which appear to have been thriving with a minimum of watering and fertilizer, or very probably with none at all. A landowner desiring to plant species other than those indigenous to West Hawaii would find examples of interesting Oahu and Maui beach plants, such as the ohai and creeping naupaka, at the University's Lyon Arboretum.

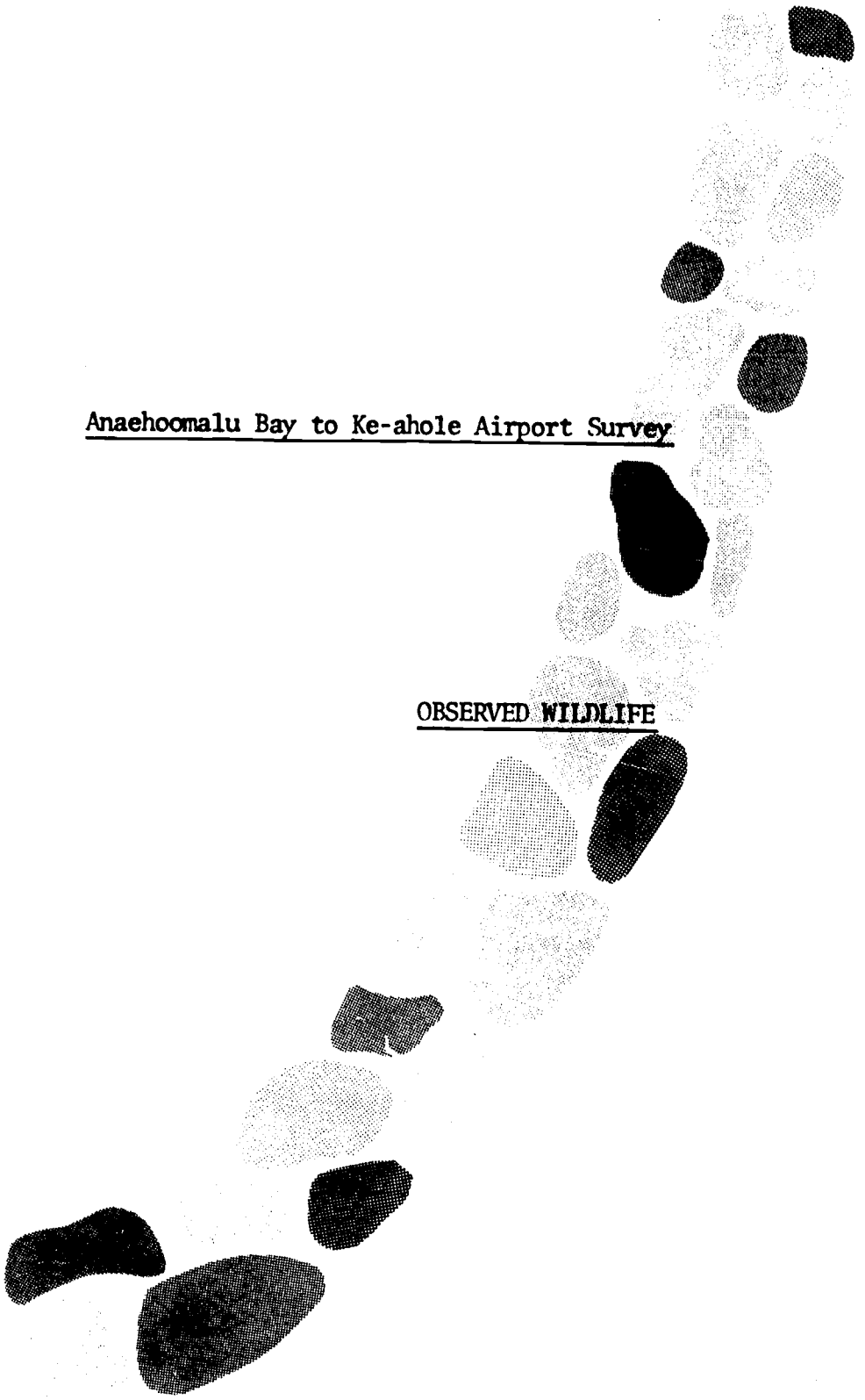
As the highway and trail are developed through this section of coast, a responsibility arises along with it to develop the land ethic of those who will be seeing and using the resource. The pleasure of contact with nature can be multiplied manifold by promoting the visitor's perception of natural processes, both of the ways by which the land and the living things upon it have achieved their characteristic forms (evolution) and the ways by which they maintain their existence (ecology). This kind of recreation engineering will cause little consumption, dilution or artificialization of the natural resource.

For many years, this stretch of coast has been protected by its remoteness. Now, with an imminent expansion of transportation

forms and opportunities, its protection must be an expansion or growth in public receptivity and awareness. Society owns the capital stock here, and by wooing this earth it can be managed to pay dividends to all.

The next few years will be critical ones for this stock, the outcome depending upon the achievement of new levels of thinking, planning and joint effort by the myriad interests.

An overriding impression a person acquires as he moves through these many ahupuaa is one of "specialness of place". And along with it comes the question: "How could so many people have once lived here, yet have left it in a condition seemingly equal to that which it was before--clean, refreshing, wild and free?"



Anaehoomalu Bay to Ke-ahole Airport Survey

OBSERVED WILDLIFE

OBSERVED WILDLIFE

The following is an annotated list of the bird and mammal species observed by me from September 26 to 30, 1972 while accompanying the Ala Kahakai survey party from Waiulua Bay to Ke-ahole Point:

Game Birds

Laceneck Dove - A few individuals were seen in the larger kiawe kipukas. The population of this species is not large enough to support hunting in this area.

Barred Dove. Common in most of the kiawe kipukas but not abundant enough to provide good hunting. Small flights of doves were seen in the brackish water holes at Waiulua, Keawaiki, Kiholo, Kua Bay and Makalawena.

Grey Francolin. May be found in all of the kipukas along the coast, particularly in the larger kiawe kipukas, but in low numbers.

Turkey. This species was noted only at Keawaiki and was probably released there by the owner.

Song Birds

English Sparrow. A few were observed only at Kaupulehu but is probably present at Keawaiki, Kiholo and Anaehoomalu and Makalawena also.

Kentucky Cardinal. Present in all of the larger kipukas, especially those with ponds.

Brazilian Cardinal. Much less abundant than the Kentucky cardinal. It was observed at Anaehoomalu and Makalawena only.

Linnet. Common in all of the larger kipukas, especially Anaehoomalu-Kapalaoa, Keawaiki, Kiholo and Makalawena.

White-eye. Present in all kipukas but not abundant.

Ricebird. Seen only at Keawaiki and Kiholo but probably occur in all larger areas in low numbers.

Mynah. A few were seen at Anaehoomalu and at Kaupulehu only. May occur at Keawaiki and Kiholo as this species is usually associated with human habitation.

This section was prepared by David H. Woodside, Wildlife Biologist, State Department of Land and Natural Resources.

Shorebirds and Waterbirds

Black-crowned Night Heron. This species visits all of the ponds along the coast occasionally. It was noted at Waiulua, Kapalaoa, Kiholo, Kua Bay, and Makalawena. The total population is probably less than 10 birds.

Hawaiian Stilt. A total of 18 stilts was seen at Opaeula pond in Makalawena. The stilt probably visits other shallow ponds in the area but only rarely.

Hawaiian Coot. Four coots were counted on Opaeula pond at the time of our visit. This species also has been recorded at Anaehoomalu and Kiholo but apparently it is a permanent resident only at Opaeula.

Wandering Tattler. A few individuals of this common migratory species were seen foraging along the rocky coastline and at ponds.

Golden Plover. A few plovers were seen feeding in the strand vegetation and in the kiawe kipukas along the entire coastline. Several were noted at Anaehoomalu and at Makalawena.

Ruddy Turnstone. A few turnstone were noted at ponds north of Opaeula. However, the species most likely visits all of the larger ponds in the area occasionally.

Sanderling. Two were seen at Kukio.

Least Sandpiper and Sharp-tailed Sandpiper. One of each of these uncommon migrants was seen at Opaeula.

Game Mammals

Feral Goats. Goat sign in the form of droppings was noted in all of the kipukas along the entire coastline. Based upon this evidence it appears that the area between Keawaiki and Lae Mano supports the largest population. As the flocks of goats normally move considerable distances both in a mauka-makai pattern and from kipuka to kipuka pattern as they are disturbed by hunters or to seek fresh feeding areas, it is not possible to estimate numbers. It appears however, that increasing visitor use since the construction of jeep trails has greatly reduced the goat population in the entire area.

Feral Pigs. Signs of pigs were noted only at Kiholo where they had been rooting in the area west of the main pond. The rest of the area is too dry for pigs apparently.

Feral Donkey. The only concentration of signs of feral donkeys was found in the area between Kiholo and Kaupulehu, particularly in the kiawe kipuka behind Lae Mano.

Some Comments

In general the vegetation type found in the kipukas does not

support high bird populations and it is not recommended that bird hunting be considered as plans are developed for increasing use of the area.

The most important pond area for birds is Opaeula pond at Makalawena. This pond should be retained in its natural state and be set aside as a permanent wildlife refuge.

It can be expected that with the completion of Ke-ahole-Kawaihae road the population of donkeys will be exterminated and that the goat numbers will be reduced even further. It will probably not be feasible to attempt to "manage" the goat population as their movement between private and government owned lands cannot be controlled.

Anaehoomalu Bay to Ke-ahole Airport Survey

PLACES WITH HISTORICAL, ARCHAEOLOGICAL AND LEGENDARY INTEREST

PLACES WITH HISTORICAL, ARCHAEOLOGICAL AND LEGENDARY INTEREST

Hawaiians of the prehistoric period walked along many trails in what is now referred to as the Kamehameha Coast, or West Coast of the Big Island of Hawaii. Later Hawaiians and others used these and newer trails. This section reviews these ancient and more modern trails, and the places of historical, archaeological and legendary interest found along them. Specific recommendations for further State and County surveys also are offered, as are references for further study.

Anaehoomalu

a. A portion of the famous Puako-Kiholo trail. The rather straight, well-worn historical trail shows up clearly on the aerial photos and contrasts with an earlier winding, less distinct prehistoric trail. The demands of commerce and communication in historic times created the need for trails and a road tax provided the labor that made their construction possible. A thorough archaeological-historical study of these trails should give a clearer understanding of the role of trails in Hawaiian history and the effort that went into building and maintaining them. Some work on this subject has been done, mainly in the area around Honaunau (Apple, 1965), but much more has yet to be written about the role that trails played in relations between Kohala and Kona.

b. Anaehoomalu petroglyphs. A study of these petroglyphs is being made presently. Hopefully, at some time in the future there will be sufficient information gathered on the various petroglyph fields so that comparisons can be made and perhaps some general theories be put forward that lead toward a better understanding of the meaning of Hawaiian petroglyphs and their function in Hawaiian society. (Puako, 1964; Barrera, 1971; Cox, 1970, 1971.)

c. Waiulua Bay. Already this bay has been bulldozed so that its original shape has been destroyed and much of the area surrounding the bay no longer contains evidence of human habitation. A causeway has been built that cuts off the inner portion of the bay from the pools in the low-lying tidal flats south of the inlet. (Barrera, 1971. See Kelly, Ms. Fig. 6.)

d. The fishponds of Kuualii and Kahapapa at Anaehoomalu. (See Kelly, Ms. Fig. 7 a, b.) In recent times the Anaehoomalu ponds have been one of the sources of mullet pua (juvenile mullet) as stock for Kaloko fishpond (Kelly, 1971:35). There are abundant pua as well as adult mullet in the Anaehoomalu ponds today. A history of these ponds would enhance knowledge of their relationship to other ponds

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This section was prepared by Marion Kelly, Anthropology Section, Bishop Museum.

along the coast, their prehistoric use and more recently their role in Kona-Kohala historic relations. Studies of pond and ocean mullet would provide much needed information on them, the shoreline environment in which they thrive, and how Hawaiians developed them as a resource.

Kapalaoa

a. Homesteads created by the Land Act of 1895, which made certain government and crown lands available for homesteading. Puuanahulu was one of the ahupuaa in which land was made available. Two homesteaders took up lots at Kapalaoa, John Alapai'i and James Purdy. (See Kelly, Ms. Fig. 10). Between 1896 and 1916 about 20 people lived there, but since then no one has lived there permanently (Kimura, n.d.).

The legend of the area tells about a chief, Pohakuloa and his wives who refused to give food to Pele when she appeared among them in her human form. She returned shortly in the form of a lava flow and turned to stone the chief and his wives who were trying to escape by running out into the sea. They can still be seen today standing in the sea scattered a few yards from shore with their belongings, a food calabash and a lei niho palaoa.

Only brackish water is available here and the land is called Kekaha-wai'ole (Place without water).

b. Petroglyphs. Some interesting petroglyphs just south of the last homestead wall should be preserved.

Akahu Kaimu Bay

The presence in the aa lava next to the trail of a series of beautiful brackish-water ponds with colorful algae give distinction to an otherwise commonplace bay. (See Kelly, Ms. Fig. 11 a, b.)

Unnamed Bay between Akahu Kaimu and Weliweli

A trail system, criss-crossing the wild expanse of aa lava, connects some coastal areas with the inland trail system.

Weliweli

Remnants of a small-boat dock are still visible. The ponds are distinctive as are the lauhala-covered dressing houses next to them. They were made by Jack Paulo who worked for the Von Holts for many years.

The cement wall in front of the house was built in 1952 after the tsunami of 1946 destroyed the old one which dated to 1930.

Pueo Bay Ponds, Trails, House Sites and Shrine

This area bears studying. Surrounded by an aa lava flow (probably part of the 1859 flow), an earlier trail can be seen to have been covered by the flow on the south side of the kipuka. Numerous sites surround the main pond, including some large platforms, a walled house yard, small walled ponds, trails, and a shrine. Several hala trees still grow beside the pond.

Keawaiki

For those persons wishing to take the inland trail to Kiholo from Keawaiki, the connecting trail at the southwest end of the kipuka should be clearly marked. The ponds here are in good condition and the bathing pool at the north end is clean and in excellent condition.

Ohiki Bay and Hou Point

There is no marked coastal trail between Keawaiki and Kiholo, but because this portion of the 1859 lava flow is pahoehoe, waking along the cliff is relatively easy. Many fish were seen from the top of the cliffs, including all the usual rockfish and several of the l rge blue uhu as well as large ulua, leopard rays, crabs, 'opihi, and ha'uke'uke.

Kiholo

The site of Kamehameha I's large fishpond described by Ellis and Lyons. (See Kelly, Ms. pp. 13-14.) Nearly all the pond was filled in by the 1859 flow. The remainder--merely the front edge of the original pond--gives some idea of its former width. Along the outer edge is a peninsula which is said to have been man made and is probably the remnants of the original wall of the pond. It is connected to the land at its north end. At its south end is a small islet with a channel on each side. Springs were observed feeding fresh water into the pond at its north end.

The Puako-Kiholo trail over the 1859 lava ends near the south end of the pond. A little farther along the coast, near Keanalele, the trail picks up again and goes inland toward Puuwaawaa Ranch.

The inland ponds at Kiholo are large, but in very poor shape, being mostly filled with silt, algae, and other vegetation. No mullet were seen in them. There are fresh water springs which can be seen clearly at low tide among the rocks just offshore toward the west end of the beach, not far from the remains of the church.

The church shell still stands (rock and cement). Evidence of its having burned is present. It was probably built in the first decade of this century. Nearby are the remains of what was once a small hotel, according to Miss Frances Damon. Also, there was once a small wharf or cattle chute at the point. Here pigs, goats and

cattle were loaded onto interisland ships.

Keanalele

This site is not much of a waterhole any more, but it is the coastal end of a series of caves that honeycomb the area, running in a mauka-makai direction. Many of the caves have been lived in and ruins of surface structures provide mute evidence of additional living sites, many of them seemingly associated with the caves. Archaeological work should be done here before the area becomes more accessible to the general public. The highway will come within two-thirds of a mile of Kiholo, and some of the caves will be visible a short distance from the highway.

Waielepi

This was the site of a large historical salt works. Many of the structures still visible. A history of this site and its relation to the salt pans of the Kalaemano area a little farther along the coast should be researched and written.

Luahinewai

This name is misspelled on some maps. "Luahinawai" should be "Luahinewai" (Ii, 1963:171; Elbert, Ms: p. 457). This pond is said to have a mo'o living there. It is the deepest pond seen along this entire coast (see Kelly, Ms. Fig. 21).

Kalaemano Coastline

The archaeology of this area should be studied. This is a large area apparently capable of supporting a population of considerable size at one time. Ruins of many salt pans can still be seen today (see Kelly, Ms., Fig. 23). People from Makalawena remember going by canoe to Kalaemano for salt.

Kaulupulehu

This place name is usually shortened in speech to Kaupulehu, but the correct word is Ka-ulu-pulehu, which means "the roasted breadfruit" (see Kelly, Ms., p. 14). The petroglyphs of this place are unique. Many are large canoe sails that are difficult to photograph. The Kona Village Hotel encourages their guests to visit them.

One of the three private property signs that we observed along the coastal trail was encountered here as one leaves the aa flow and approaches the hotel. The other two were at Anaehoomalu near the makaha of the fishpond and on the fence of the Parker Ranch picnic grounds, and at Kukio.

Kukio

There are many archaeological and historical sites here and a

history that should be preserved. Kukio was in historic times the center of a fishing hui and a goat ranch. There are also fishponds, many house sites and grave sites around Kukio and Kakapa Bays. Many cave sites at Kakapa and Kua Bays have been excavated, and debris left in piles around the entrances. The commonplace artifacts such as coral and sea-urchin spine files have been left behind.

Kua Bay

A most beautiful white sand beach and perfectly shaped bay with a sand bottom. The remains of a small pond are still visible.

There is a large platform area at the north entrance to the bay and many habitation sites. An archaeological survey should be done before this area is made into a County park, so that the best sites can be preserved and a history of the area written from excavation of others.

Awakee

There are sites in this area that should be studied. Already the present road along the shoreline goes directly through a historic site. The water cistern is on the left of the road and the house site on the right (makai). There are many ponds around the border between Awakee and Makalawena.

Makalawena

A beautiful set of small bays with many legends. Makalawena was the most prominent town of this area back in the first decade of this century. Essentially a fishing village, it boasted a church, school, store, and 7 or 8 houses at one time. All houses were wiped out in the 1946 tsunami. Only one house was rebuilt, that of Annie Una. Her last husband, Porto, still lives at Makalawena. Raising goats and chickens, and going fishing are his principal occupations.

The pools surrounding the main pond "Kapo'i-kai", are used to cultivate 'opae-'ula as bait for 'opelu fishing.

Mahaiula

There are archaeological sites and ponds at Mahaiula. Many other sites are to be found along the coast toward Ke-ahole Point, including boundary markers, and ruins of shoreline ponds (Reinecke, Ms. 1930).

Kohanaiki

Many sites and ponds confirm stories of a substantial population in earlier days. There is at least one large heiau on this land.

Kaloko

Both makaha of the fishpond wall have been closed, a chain has been put across the trail on the wall, and a dredge sits in the middle of the pond. A construction shack has been built on the site, although no building permit was visible.

Honokohau

Among the strange, great ahu on the border of Honokohau and Kaloko is a delightful pool called "Queen's Bath" as so many are named today. The water is cold and refreshes the hot, tired hiker.

Remains of an old fishpond built seaward of the present coastline, makai of Aimakapa pond, can still be seen. Two petroglyphs were found just south of the present small boat harbor.

Kealakeha-Keahuolu

North of the old Kona airport and south of Kaiwi Point are many house sites and agricultural areas.

Ellis described this area as a pleasant place with shade trees and other plantings:

> "In the afternoon, Messrs. Thurston and Bishop walked out in a N.W. direction, till they reached the point that forms the northern boundary of the bay, on the eastern side of which Kairua is situated. It runs three or four miles into the sea; is composed entirely of lava....."
>
> * * *
>
> "They enjoyed a fine view of the town and adjacent country. The houses, which are neat, are generally built on the sea-shore, shaded with cocoa-nut and kou trees, which greatly enliven the scene.
>
> "The environs were cultivated to a considerable extent; small gardens were seen among the barren rocks on which the houses are built, wherever soil could be found sufficient to nourish the sweet potato, the watermellon, or even a few plants of tobacco, and in many places these seemed to be growing literally in the fragments of lava, collected in small heaps around their roots." (Ellis, 1963:30,31.)

Today there is nothing. Only one small brackish pool was found next to the west end of the old Kona airport. Small salt pans were found at nearly every house site. A study of this area would help to reconstruct the scene as Ellis, Thurston and Bishop saw it.

Recommendations:

Archaeological and historical surveys of the important geographical areas along the coastal trail and related topics would add to what is already known and help to protect what is there. Such surveys should be encouraged by the State where private lands are located and should be contracted for by the State and County governments wherever public lands are involved. These surveys should include the following areas and topics:

Trails of South Kohala and North Kona.

Fishponds and pools of South Kohala and North Kona.

The Pueo Bay area and its environs.

Kiholo and its environs, including Keanalele and Waielepi.

Kalaemano coastal settlement.

Saltworks of Kohala and North Kona.

Kukio and Kakapa Bays settlements.

Kua Bay settlement.

Awakee and Makalawena settlements.

Mahaiula coastal settlements.

Ke-ahole-Kohanaiki coastal settlements.

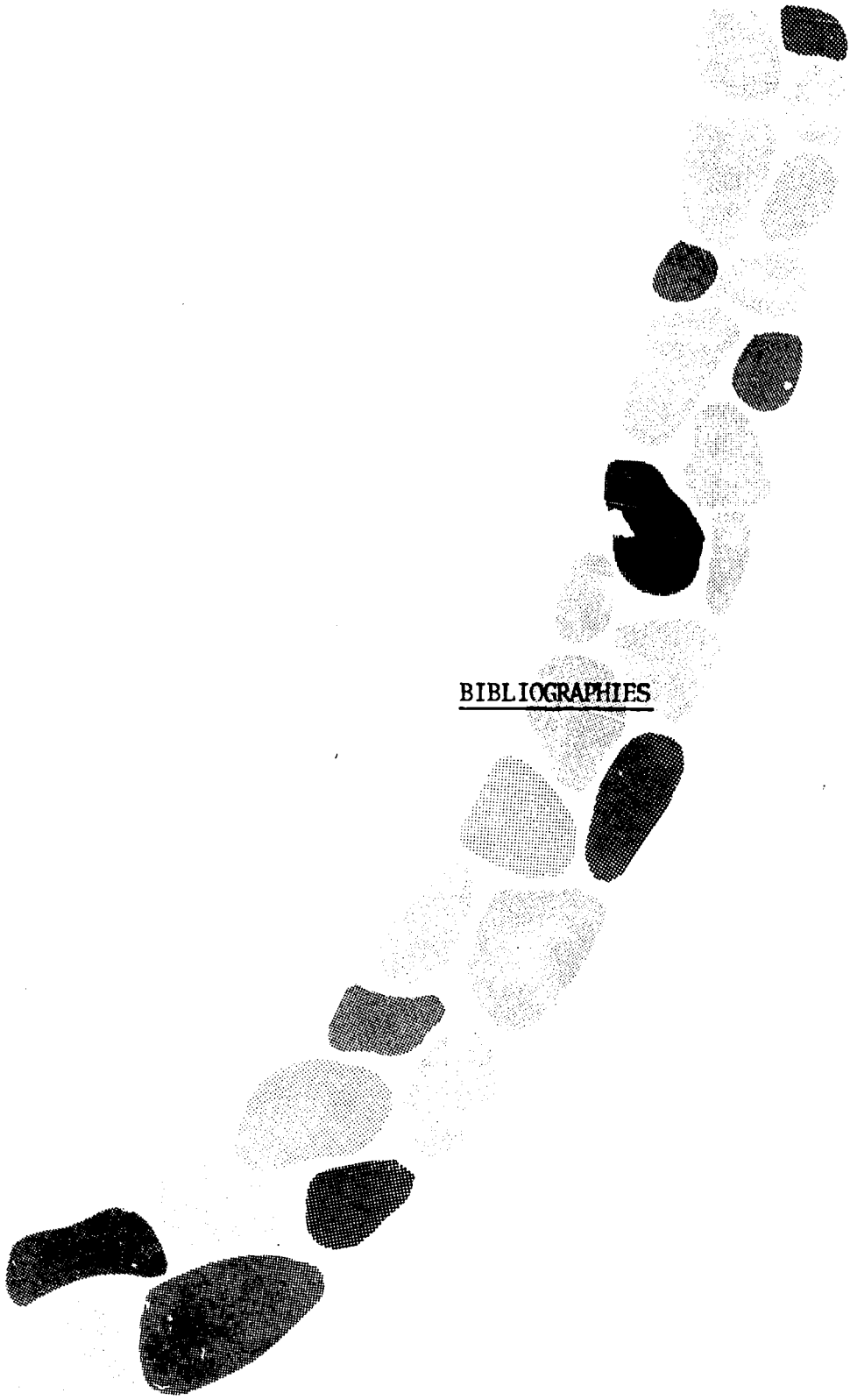
Kaiwi Point and environments, especially between Kaiwi Point and the old Kona airport. A study of this area should produce a fairly reliable statement on marginal agriculture in a dry coastal settlement area.

Boundary markers of South Kohala and North Kona.

Legends and people of Kohala and North Kona.

Fishing settlements of Kohala and Kona: techniques, equipment, calendar, relations with inland settlements.

Agriculture in dry coastal villages of South Kohala and North Kona.



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Bishop Museum: Marion Kelly

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GENERAL SHORELINE SURVEY ACKNOWLEDGMENTS

During the period September 26 to 30, 1972, an 11-member survey party hiked from Anaehoomalu Bay to the Ke-ahole Airport on the Island of Hawaii to examine the various historical and natural features that occur along the approximately 18-mile stretch of shoreline. This survey was made in conjunction with the Ala Kahakai proposal to provide public access to, and develop a trail system along, 30 miles of West Hawaii shoreline between Puu Kohola Heiau near Kawaihae and the old Kona Airport north of Kailua.

Hawaii residents who assisted the survey by generously providing ground transportation, delivering food and gear to campsites, or by serving as trail guides were: Francis Ah Nee, Kailua; Robert Keakealani, Kailua; Keoki Pinihaka, Honaunau; David Roy, Kealakekua; Dorothy Dreger, Kailua; Bill Kawahara, Kailua; Virginia Isbell, Kailua; Willis Sanborn and other members of the Boise Cascade staff.

The field trip provided important basic data for this study, and constituted, in effect, a first-run of what future residents and visitors may do when the Ala Kahakai project is operational.

Virginia Brooks planned and coordinated all aspects of the survey and arranged for logistical support and assistance from residents of Hawaii. The areas covered during the survey are depicted in maps published in this volume. The daily schedule was as follows:

September 26 - Arrived Kamuela from Honolulu; transported to Waiulua Bay and Anaehoomalu.

September 27 - Hiked from Anaehoomalu Bay to Kiholo Bay.

September 28 - Hiked from Kiholo Bay to Kaupulehu.

September 29 - Hiked from Kaupulehu to Makalawena.

September 30 - Hiked from Makalawena to Ke-ahole Airport; departed Ke-ahole Airport for Honolulu.

Five members of the survey party continued the survey from the Ke-ahole Airport to the old Kona Airport north of Kailua on October 1 and 2.

Throughout the survey period, good weather and calm seas prevailed, and most of the shoreline was suitable for swimming and/or fishing activities.

END